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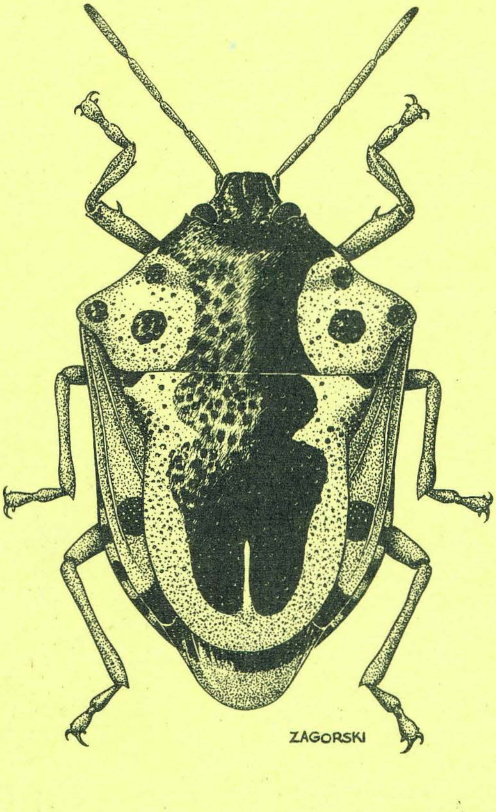

Illustration by:
Michael Zagorski, Warrenville, IL

COMMUTING TO FEED PIPEVINE SWALLOWTAILS

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I must admit that I do not usually read all the articles in Y.E.S. QUARTERLY; I like the Tradingpost. But I read and really enjoyed the articles "Too Many" and "The Butterfly Bush" in the June (1986) issue, as I have had similar experiences.

I am eleven years old and have collected and studied the Lepidoptera for three years. One of my favorite butterflies is the pipevine swallowtail (Battus philenor hirsuta), the caterpillar of which only eats Dutchman's Pipe (Aristolochia californica). My mother got the idea of having some in the garden and wanted to plant some in our yard. However, the closest wild pipevine to us is in Davis (Calif.), about 60 miles away.

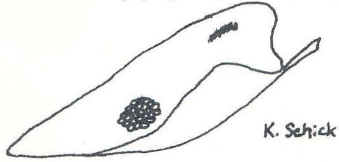
In April (1986) we happened to be in the Davis area, so my mother collected some pipevine. In it I found a leaf with a bunch of tiny orange eggs. Within a week these had turned amber and thirty tiny brown caterpillars had emerged. By now my mother's plants had lost most of their leaves. She called local nurseries, but no one here had pipevine (but they sold us a butterfly bush), so within a week we made another trip to Davis.

When we got home we found twenty tiny stowaway caterpillars on one leaf. Two weeks later, when both refrigerated and outdoor leaves had died, we made another long trip, this time returning 25 caterpillars to the wild. By now the caterpillars had changed from brown to black with orange spines and had grown nearly 2 inches. So who would have thought to look for eggs on the leaves we brought back? You guessed it, within ten days we had two more clusters of tiny brown caterpillars; caterpillars in three sizes!

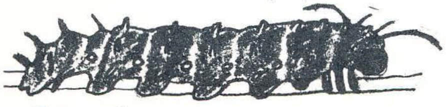
Our caterpillars went through a dramatic instar change when they were three weeks old; dropping off their old faces and tearing off their old skin from their tail ends. Then at four weeks each one attached its tail end to the glass wall of the terrarium with silk, then made a silken sling for the middle of the body and then split out of its old skin from the head end on down. After wiggling to drop the old skin, the new chrysalis hardened, turning either brown or green.

Some of the butterflies may emerge in June; other (I hope most) will go into diapause and wait until next spring.

My mother's plants all died. Does anyone know where she can buy Dutchman's pipe plants? It sure would save a lot of driving!

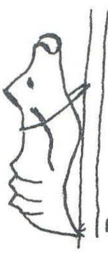


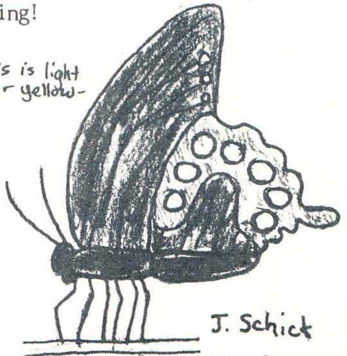
eggs are orange
second instar caterpillar is brown



Pipevine Swallowtail caterpillar (color spines orange)

Chrysalis is light brown or yellow-green.





adult butterfly

ADDITIONAL DISTRIBUTION RECORDS FOR THE RECENTLY-DESCRIBED SPECIES HARPALUS KATIAE BATTONI (COLEOPTERA: CARABIDAE)

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Recently, Dr. F. Battoni (1985) of Macerata, Italy described a new species of Harpalus, subgenus Megapangus Casey, from the southwestern United States. This new species, H. katiae, is morphologically similar to the large (20-30mm) ground beetle Harpalus caliginosus DeGeer. The two species can be distinguished by the presence (H. caliginosus) or absence (H. katiae) of coarse punctures on the head inside of the eyes. See Battoni (1985) for additional information on the identification of these two species.

The type series consisted of 34 specimens from 4 localities in Texas, namely Wichita Co., near Burkeburnett at the Red River (type locality); Willacy Co., Raymondville and Lyford; and, Victoria Co., Victoria. Dr. Battoni was kind enough to send me some of the paratype specimens to place back in my collection. After studying the paratype specimens I went through the remainder of my Harpalus "caliginosus" and found a large number of the new Harpalus species. Since these records add considerably to the knowledge on the geographical distribution of Harpalus katiae, I shall list the records from all the specimens I have collected.

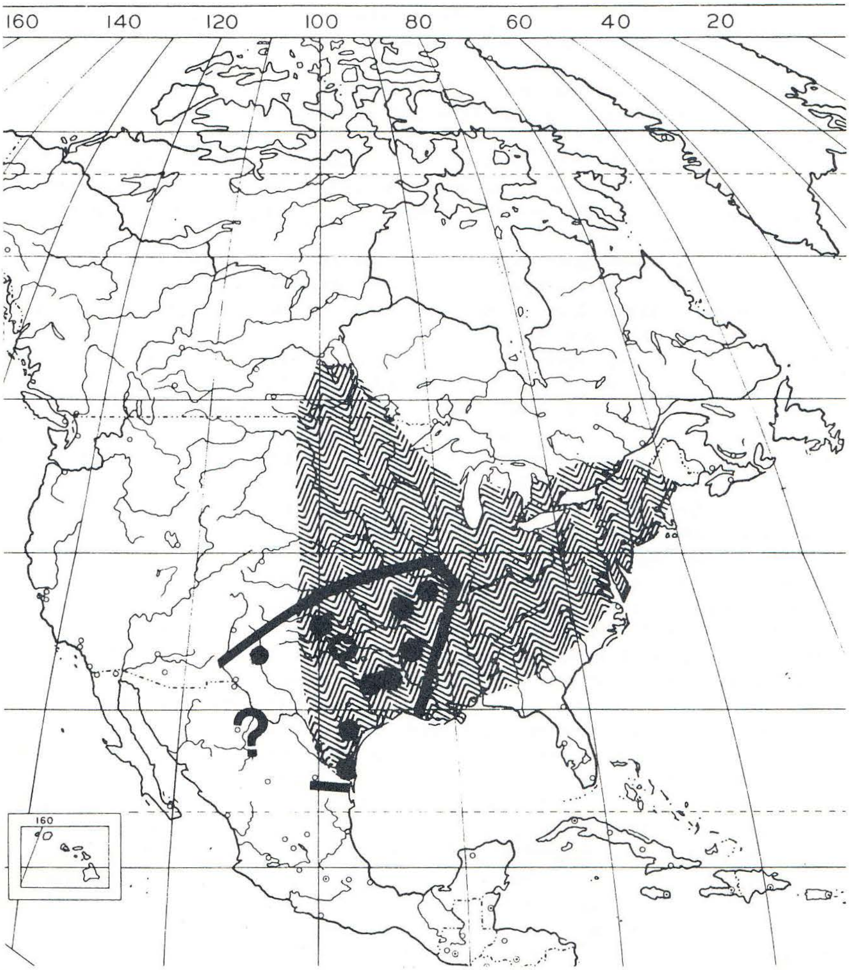
Harpalus katiae has been collected at the following localities in the United States (fig. 1):

TEXAS: Falls Co., Falls on the Brazos Park, 8-x-1985 (8 specimens); Live Oak Co., near Mathis, 7-x-1985 (4); Cameron Co., Rio Hondo, 9-x-1984 (3) at lights, 12/14-x-1984 (2) at lights; Henderson Co., 3 miles E. of Malakoff, US 31, 7-x-1984 (1); Van Zandt Co., 1 mile S. of Grand Saline, 31-viii-1980 (1) at light; Willacy Co., Port Mansfield, 11-x-1985 (1);
Palo Pimto Co., I-20W Rest Area nr Brazos, 24-v-1984 (1); NEW MEXICO: Chaves Co., Bottomless Lakes State Park, ix-10-1981 (10) at lights; OKLAHOMA: Beckham Co., 9 miles E of OKLA/TEXAS state line on I-40E (rest area), 11-ix-1981 (3) at lights; ARKANSAS: Nevada Co., 1-3 miles SSW of White Oak Lake State Park, 6-x-1984 (1); MISSOURI: Franklin Co., near St. Clair, I-44W rest area, 22-vii-1982 (2).

It would appear that there is considerable overlap in the distribution of H. katiae and H. caliginosus, although the former species is definitely more southern in its distribution.

REFERENCES

Battoni, F. 1985 Una nuova specie di Harpalus Latreille, 1802 (subgenus Megapangus Casey, 1914) degli U.S.A. (Coleoptera: Carabidae). Giornale Italiano di Entomologia 2(11):355-360



Distribution of Harpalus katiae Battoni (dots; star = type locality) and H. caliginosus Fabricius (shaded area) in North America based on collection records from the collection of G.A. Dunn.

COLLECTING IN RAJASTHAN (INDIA)

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On the 18th of August 1985 I arrived with my parents at Delhi airport. At this time of the year the monsoon is just over and that is why the air moisture is quite high. Because of the humidity and temperature, the climate is really unpleasant. Most tourists visit India in the winter when it is cool and dry, but entomologists would not be happy then because they will not find as many insects as they would after the monsoon season.

India is a very large country and we did not have time to see the entire country in this single journey, so we decided to concentrate on only one part of it: Rajasthan. Rajasthan is divided into two parts by the Aravalli Mountains (fig. 1). West of the mountains there is only desert, but east of them there is fertile country. On 19 August we departed for Jaipur. Jaipur, like Bikaner, Jaisalmer and Jodpur, is located west of the Aravalli Mountains in the desert (which is called Thar). The Thar desert is not like the typical desert you may have in your mind. There are nearly no sand dunes (you have to look hard to find them). In most parts there are only stones and thorny bushes. These bushes are quite a problem for the entomologist because they can easily tear a net to shreds. Because of this it is a good idea to take extra net bags so you can replace torn ones.

We were not really very lucky in the beginning of our journey. On the way to Jaipur it started to rain and the streets became very wet. We had to drive through a brook and because of that, water got into our light machine (trap) and it was ruined. So we lost the whole day in Jaipur. That is why I did not get to collect there. Then we drove to Bikaner. I collected some black and nearly globular tenebrionid beetles one afternoon, but I soon came down with an infection and I was not able to collect more insects there. I took some good medicine and soon regained my health.

On the way to Jaisalmer some big black insects flew onto our windshield. At first I thought they were some kind of Hymenoptera, but when we stopped and caught some I found out they were beetles of the genus Scarabaeus. When they are flying they do not open their forewings, so they looked very funny. During the rest of our journey I did not find any other place where there were so many of these beetles. Some time before we arrived here, there must have been a herd of cows or camels in the area because there was a lot of dung to attract these Scarabaeus. Most of the interesting beetles I found in the desert were found in or near dung. It is very important to take tweezers/forceps with you, especially if you do not want to pick the beetles out of the dung with your fingers! On the way to Jaisalmer I also saw some interesting ants. They did not have an ant hill, only a hole where they came out of the soil. These ants had very long legs, and I think perhaps this was an advantage for them when they had to run in the sand. In Jaisalmer there were very few insects. All I found were a small grasshopper and some Myrmeleonidae at some lights.

Next we went to Jodpur. Around our hotel was a nice garden which attracted *Colotis amata*, *Tarucus* sp., some yellow Papilios with black spots and some Chrysididae. At night I ran into some new problems to interfere with my collecting. There were many hungry bats flying around the lights, and at least one gecko sitting on each lamp. Most insects would be consumed by one of these hungry predators almost as soon as I spotted them myself. There were also some problems with the electricity and sometimes all of the lights would go out. I found myself standing in the middle of a dark, gloomy garden and I had to grope my way back to the hotel in the darkness. This is one reason why a pocket lamp is very useful when collecting at night.

In the desert I caught two scarabs (perhaps *Copris* sp. females) and two big yellow grasshoppers with blue stripes. We visited a gorge with some standing trees in it. We were able to climb down into the gorge and I collected some histerids and some interesting scarabs - an *Onthophagous* sp. and a metallic green species (*Scarabaeus* sp?). This is the only place I found this green scarab beetle. We returned to the hotel and I prepared the grasshoppers and set them out on a table while we went to dinner. When we returned the specimens were surrounded by ants and the specimens were damaged. I learned you must be careful with your specimens in India; pack them away in boxes so ants and other pests don't get to them!

Next we left for Mount Abu. Along the way I found the remains of *Stenocera* sp. on the road. These insects have a metallic green head and thorax with brown forewings. I wanted to catch a live specimen so I took my net out. Suddenly a lorry stopped and the driver jumped out and started to shout at me. He seemed very angry, so I immediately went back to our car, got in and locked the door. He followed me to the car and then began talking to the driver. During the discussion he got louder and louder and seemed very aggressive. Our driver decided to drive away from this fellow rather than risk a brawl. Afterwards our driver explained to us that this fellow was a fanatic Hindu and he wanted to keep me from killing insects. Rather than stopping my insect collecting, I decided to be more careful in the future.

In Abu I saw a lot of butterflies (*Terias*, *Ixias*, *Pieris* and a black and white danaid butterfly), but they were very fast and would not sit down, so it was nearly impossible to catch some of them. Running after them was too dangerous, mostly because of the many poisonous snakes in India. For example. there were a couple of cobras in the garden of our hotel in Abu. In the event that you are bitten by a snake in India, the chances of finding the right serum and a good doctor are not all that great. It pays well to watch were you put your hands and feet! I had better luck catching other groups of insects. In a brook I captured some *Gyrinis* sp. and on some nearby flowers I caught some big black Hymenoptera (possibly the genus *Xylocopa*). At night I caught some species of noctuid moths (e.g., *Adris* sp.), arctiid moths, a yellow lasiocampid moth and two big scarab beetles (I think one of them belongs to the genus *Catharsius*). There was also a species of Notodontidae that came to the light which immediately sat on the wall and remained there the whole night and the next day too.

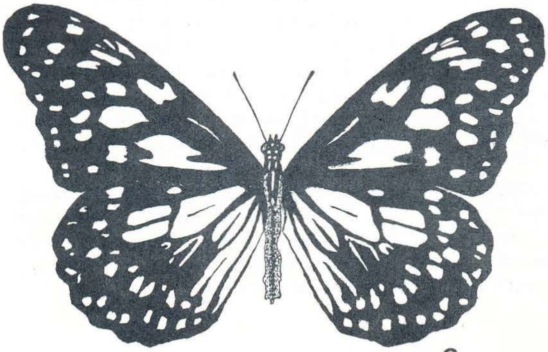
In some areas near Udaipur I tried to find some beetles in dung. Although the habitat seemed right, I was only able to catch one beetle there. In Kota I caught the nicest butterflies of our journey at our hotel and a mogulgarden on the flowers. I also caught some cetonids and some interesting dragonflies with brown markings on the wings.

Of the places I visited in Rajasthan, the most interesting was Keoladeo Ghana, a famous bird sanctuary. It is a large area and in it you can find different habitats like swamps, forests and arid areas. In the winter thousands of birds come to this sanctuary, but I found that the insects are also worth seeing here. You can find many species of Hymenoptera (yellow bumblebees, some with blue and black stripes; some sphecid wasps, Chrysidid, mutillids, and bees that built big nests on the trees), membracids, curculionids, chrysomelids, asilids, danaids (fig. 2) and satyrids. At night I collected even more. There were clouds of small Nematocera and Jassidae flying around the lamps; there were also noctuid moths, tenebrionid beetles, scarab beetles (the same Catharsius species as at Mount Abu and a big Heliocopris sp.), two cerambycid beetles, carabid beetles (bombadier beetles and Scarites sp.), belostomatid bugs, and many big, black hydroids.

I think light traps are the best way to catch the large aquatic insects. I continually tried to capture a large Belostoma or a big hydroid by using my net in the water, but I never got a specimen larger than 5mm. Even collecting these insects at the light was challenging because if I didn't catch the insects shortly after they landed they were quickly attacked and killed by some of the many big ants present. After a few minutes all you could find would be the elytra!

Three species of meloid beetles were common in Keoladeo, and two of these species readily flew to the lights. I made the mistake of doing my night collecting in white clothes and I found that the meloids loved to land on me. Some crawled up my sleeves or down my collar; this did not alarm me because I had not had any experience with these blister beetles before. Some of the beetles got crushed and the next day I had very big blisters on my whole body. I took some medicine and in a couple of days the blisters healed. However, the blisters were very unpleasant and the risk of infection was very high. This is why I would suggest that you tie your sleeves and collar if you are collecting with lights and you see these beetles beginning to appear.

I want to thank my parents for making this journey possible and for helping me collect. I also want to thank Professor O'Brien and his wife whom I met in Keoladeo, for answering a lot of my questions and suggesting I contact the Young Entomologists' Society. I hope I have given other Y.E.S. members some idea of what it is like to collect in India. I wish I could tell you the names of all the insects I caught, but I have only been able to identify many of them to family or genus level. Furthermore, I hope that other Y.E.S. members will write articles in Y.E.S. QUARTERLY about their personal entomological experiences and adventures.



Drawing of danaid butterfly caught in Keoladeo Ghana, India by Alexander Reidel

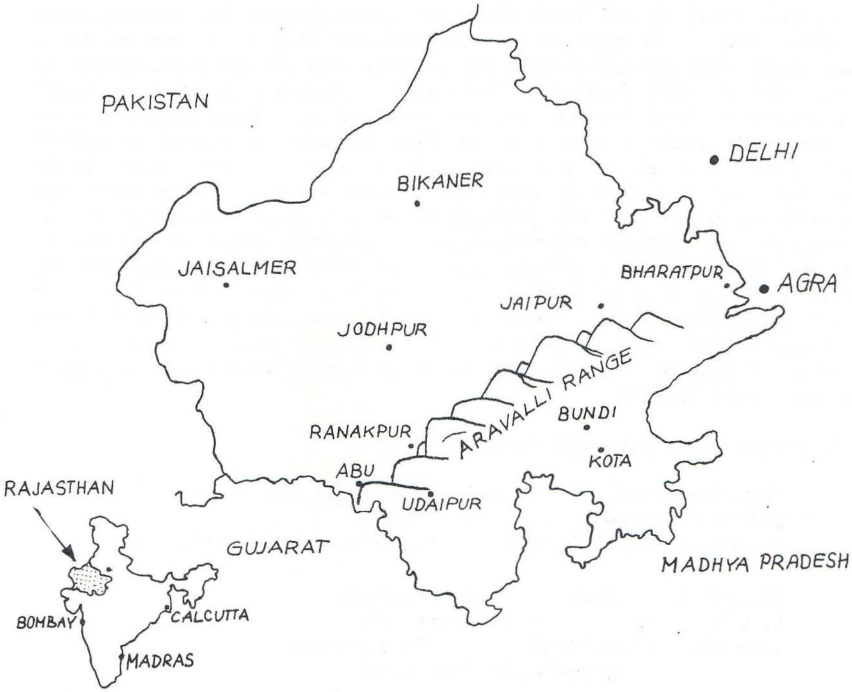


Figure 1. Map of Rajasthan State in western India.

LOOK OUT! THERE'S A BUG ON YOUR CHEST!

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Palatine, IL 60067 USA

It is an understatement to say that entomology needs publicity. The public, as a rule, do not know what an "Entomologist" is. Professionals frequently find it difficult to describe exactly what it is they do for a living; those that collect insects for a hobby may be too embarrassed to inform others. Stop hiding in the closet! Publicity is what we need. Alert others to your interest and be proud of it. What better way to advertise and proclaim your interest than to wear it around in public? Many stores now print and sell custom T-shirts, with any phrase imaginable, but a picture is worth a thousand words. Insects are rarely portrayed on shirts and the production of individual custom shirts for illustrations are prohibitively expensive. However, there are companies that specialize in insect designs and print many from a single pattern, thereby offering quality T-shirts at a minimal cost. Only four such sources are known to me. These are listed below, along with with insect impression rubber stamp distributor. Members may want to request copies of these companies catalogs and see what insect designs are available. Wear your insects proudly!

Sources of insect pattern T-shirts:

Absurditees Ink.
6007 NW 57th Blvd.
Gainesville, FL 32601 USA

BioQuip Products, Inc.
P.O. Box 61
Santa Monica, CA 90406 USA

Second Skin Studios
P.O. Box 5261
Lubbock, TX 79417 USA

Geographics
P.O. Box 2451
106 North Main
Monticello, AR 71655 USA

Source of rubber stamps:

Nature Impressions
1007 Leneve Place
El Cerrito, CA 94530 USA

INSECT TRIVIA

During WW II, Vietnamese tribesman and peasants fought a guerilla war against the occupying Japanese Army. The United States sent a military advisor in by parachute to help them in their fight against the Japanese. This advisor carried with him a goodwill gift from the American government - a collection of butterflies from the United States for a guerilla leader, and avid lepidopterist, named Ho Chi Minh. Who knows, maybe a box of butterflies changed the course of history in Southeast Asia. Or, maybe not.

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HOW TO CARE FOR FEMALE BUTTERFLIES FOR THE PURPOSE OF OBTAINING OVA.

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Most articles on rearing butterflies casually mention obtaining ova from the female as the first step, but assume the reader knows how to go about it, and as a result seldom go into much detail. The following are the techniques I have perfected over the years, until arriving at the present method which has proven itself to be very successful with just about any species I wish to rear.

First come the preliminaries of setting up the oviposit cage and accessories (fig. 1).

The Oviposit Cage: Most any available cage will work, but I have found certain types better than others. A soft cage made of netting is preferable to a hard wire cage, because the female will not damage her wings as quickly on the soft netting. Cylindrical cages seems better than rectangular ones because the female can fly around more naturally in it and there are no corners to trap her which helps to lessen wing damage. The preferred netting is ultra-fine (no-see-um) mosquito netting. Since many females will lay some of their ova directly on the netting, use of ultra-fine will keep all ova and newly hatched larvae inside, even tiny lycaenid larvae cannot escape through it. I have found that two cage sizes will accommodate any butterfly. A small cylinder, 6 inch diameter and 9 inches height, will handle Lycaenidae, Hesperiidae, and others up to the size of Colias. A large cylinder, 11 inch diameter and 11 inch height, will handle all larger species such as Papilio and Speyeria.

The Light and Reflectors: While it is possible to obtain ova by placing a caged female outdoors in the sun, or on an outdoor shaded porch, or indoors by a sunny window, results will probably be erratic because control over such critical things as temperature, light intensity and humidity are limited. Chances are you will find the female dead from heat-stroke or desiccation before she has had a chance to lay her ova. It is better to use an indoor setup with lights and reflectors. A 75 to 100 watt incandescent light bulb in a fixture fitted with a 10 inch aluminum reflector will provide all the necessary light and heat. The fixture should be suspended 6 to 12 inches above the top of the cage. Also, surround the cage with large side reflectors (fig. 1) to help increase the light intensity and hold the heat from the light. You should have enough of these available to completely surround the cage or cages, since several cages can fit under one light. These side reflectors can be made from a variety of materials, including aluminum sheeting, sheet metal, corrugated cardboard covered with aluminum foil or reflectors for suntanning.

The Thermometer: This is the next necessary item. It is best kept on the table beside the bottom of the cage or cages. It can also be used on top of the cage to periodically check the temperature there. Try to maintain a temperature of 80 to 85 degrees F at the bottom of the cage. The optimum temperature range that you want to maintain for the butterfly within the cage is 80 to 100 degrees F. Do not let the temperature at the bottom of the cage exceed 100 degrees F. or the female will quickly die.

The temperature can be regulated by raising or lowering the overhead light fixture, or by opening or closing the side reflectors.

The Time Clock: While not absolutely necessary for success, it is extremely helpful to have the lights regulated by an automatic time clock. The time settings are not critical and can be varied to fit your schedule. I usually set mine for 8 AM to anywhere from 4 to 7 PM.

The Feeding Solution: This consists of a solution of sugar and water. While ordinary white or brown sugar is satisfactory, I have had such good luck with a mixture of maple syrup and water that I now use nothing else. It seems that the taste of the maple syrup stimulates the butterfly to feed; also, the females usually lay their full compliment of ovae and seem to live out their maximum life span. A mixture of 1 part syrup to 5 parts water seems good. In practice, a cotton pad is saturated with the solution and laid on top of the cage. The butterfly usually finds the pad fairly quickly and will feed herself through the netting of the cage. Since the heat of the light tends to dry the pad, you must add water to the pad several times daily to keep it saturated. It is important to add only water, NOT sugar-water, as you do not want the concentration to become stronger and stronger. After three days (maximum) discard the old pad and replace it with a fresh one. Flowers can be used as food if desired, but they are troublesome when compared to the sugar-water pads, and I have found them unnecessary for maintaining healthy butterflies.

Watering: Along with feeding it seems very important to provide water. This can be done by spraying the whole cage and contents with a water mist several times daily. There are a wide variety of spray bottles or plant misters that will work for this. Usually the butterfly will start drinking the water as soon as you mist the cage. The water seems to help regulate body temperature, cleanse the digestive system, and most importantly, to promote good ova production (since the ovae contain a high percentage of water). The mist on the food plant also seems to help the female better recognize it and thus stimulates ovipositing.

Actual Care of Butterflies: Care of the female begins in the field. First, you want to try and select a good, healthy female; the more fresh the better. Only in rare instances will you catch a female that is so fresh that she has not been mated yet. A female with a fat abdomen or one that you actually observe ovipositing in the filed is sure to give good results. A worn female with a thin abdomen is sure to have already deposited her ovae in the field. After netting specimens in the field you will need a temporary holding cage. I have found that an ordinary brown paper lunch bag is the most convenient. You can keep a supply of these folded bags in your collecting sack or your pocket until they are needed. Reach into the net with your forceps and get a hold of the female with her wings folded over her back. Place her into the bag using the forceps, and release her after you close the mouth of the bag around your forceps. Some collectors place live females in envelopes for transport, and while this will work, I have found that the female is less likely to be traumatized or injured in a bag. Usually she will settle down quickly in the darkness of the bag. While the bag can be carried in your hands, it is easier to collect if both hands are free, so I clip the bag to my belt. I use a piece of string with an alligator clip on each end. The string can be either 8 inches long (to loop over your belt) or 44 inches long (to hang over your neck and shoulders).

When you finish collecting and arrive at home or your base camp, your first priority should be to feed the female(s). I usually prefer to hand feed any females this first time to be absolutely certain they feed. Get a cotton pad and saturate it with sugar-water solution. Grasp the female by the wing bases with either your fingers or forceps. Allow her front feet to touch the pad. Since butterflies taste with their feet, they will often begin to feed by themselves after coming in contact with the cotton pad. If the female refuses to feed you can try uncoiling her proboscis with an insect pin and touch it to the pad. Once you get the female to feed, cover her with a temporary cage while you get the foodplant prepared. While a small potted plant can be used, it is usually easier to cut small springs of food plants and insert them into holes punched through the lid of a small, water-filled jar. The female will usually start depositing ova the second or third day after capture. Once laying begins, the food plant should be changed daily if you want to obtain the maximum number of ova. This also prevents the female from damaging the ova already laid by clawing them. This is especially important for those species with very special ova, such as Basilarchia (= Limenitis). After the ova have been laid, I strongly advise not attempting to remove them from the surface they were laid on, as many will be damaged and therefore never hatch. If they must be moved, leave them attached to a part of the substrate by cutting around them. If they are on leaves, cut around them. If they are on bark, cut out a piece with a razor blade. If they are on twigs, cut sections with pruning shears. If they are on the cage itself you will probably have to leave them until they hatch. Then the tiny larvae can be persuaded to crawl onto the food plant, or they can be moved to the food plant with the use of a small pointed paint brush (size #00 is good). If for some reason you must remove ova from their substrate, first soften the adhesive with a small amount of water (use your paint brush) and then gently scrape them loose with a razor blade.

If you follow my suggestions, I predict that you should have little or no trouble in obtaining ova from any butterfly species you wish to rear.

Fig. 1. THE OVIPOSITING SETUP.
Note: the front reflector has been removed for this illustration.

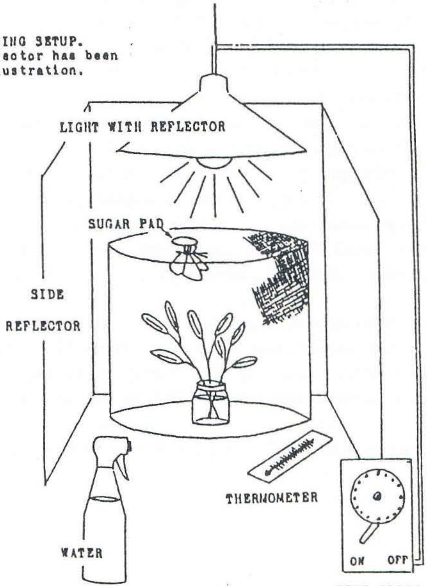

Illustration by
Sue Andres-Seabolt,
North St. Paul, MN

THE LEPIDOPTERA OF COSTA RICA - "FLASH AND DAZZLE"*

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Costa Rica, in a biological sense, is one of the most richly endowed tropical countries in the world. It has been estimated that there are 12,000 species of plants, 800 kinds of birds, 300 species of mammals, 2,000 species of butterflies, and 9,000 moth species in this tiny country, and most of the lists are incomplete. It is then no surprise that the Organization of Tropical Studies, a consortium of American universities, with the help of the National Science Foundation and the World Wildlife Fund, established remote field stations there to be used as sites for research projects. Serious scientists and graduate students from the United States and Central America dedicate their time unlocking the mysteries of the rain forest before it disappears....and time is running out. It is believed that most of the rain forests of the world will have disappeared by the year 2000, except for those put aside as National Preserves. Costa Rica is a leader in conservation programs (8% of their land is in park systems). They have set an example for all the world to see and hopefully to follow.

My tours with O.T.S. and Earthwatch have taken me to these stations deep in the national parks and preserves to study the ecology of the rain forest. At the Santa Rosa National Park, under the leadership of Dr. Daniel Janzen, Professor of Ecology at the University of Pennsylvania, we gathered information on the interactions between seeds and seed-eating insects. One of the primary predispersal seed predators are the rain-tree bruchid beetles. They lay 50 - 100 eggs on a seed pod of the Cenizero tree. The larva hatches on it and then bores a hole through the green pod, feeding on the maturing seed. The adult beetle exits the pod about the same time the pod is ready to fall from the tree, thus destroying their potential for germinating.

We carefully tended the larva of the gray-mottled sphinx moth, Pseudosphinx tetrio, feeding it every morning fresh leaves of the Plumeria tree, to await their emergence. They have never been observed beyond the caterpillar stage. The black larvae ringed with bright yellow and red-orange weighs 15 grams and is 10 cm long. It has the unusual habit of biting viciously when touched and thrashes back and forth. Because of their color pattern and unusual behavior it is believed to be a coral snake mimic.

At the request of the Museo Nacional of San Jose and Philip DeVries, a noted Lepidopterist, we collected 110 of the 150 species of butterflies known to inhabit the park. During the early evenings we would set traps for the nocturnal moths deep in the forest, filling the traps with

(* Reprinted by permission from "Scene from the Cupola", Dec. 1984) fermenting fruit. In the morning we would gather our catch and reload the traps for the diurnal butterflies. Some butterflies never visit flowers, but feed instead on rotted fruit, dung, carrion and fungi. We spent all our spare time mounting perfect specimens of male and female for each species. Dating and pinning became a tedious job. But by the end of the week boxes of butterflies were ready for the museum in San Jose.

Contrary to some beliefs, there are butterflies that are attracted to candlelight or blacklight long after sunset (Hesperiidae & brassolids), and there are day-flying moths (Calipato verde) that behave like butterflies. These moths have been seen migrating southward by the millions, coming from Honduras and ending in Columbia. There are the unusual forest butterflies from the Monteverde Cloud Forest Preserve that are so "tame" one can pick them off their perch. These are called the "clearwings" in the family Ithomiidae, of which there are a dozen species in this forest. They are easily identified by their transparent wings. All clearwings are considered distasteful to birds and other vertebrates. There are mimics of unrelated kinds of butterflies resembling the ithomiids; thereby receiving a degree of protection from predators. A similar situation occurs on Long Island (NY) with our distasteful Monarch and its mimic the Viceroy butterfly. Henry Bates (1852) was the first to study and draw the attention of the scientific community to these phenomenon we now call Batesian mimicry.

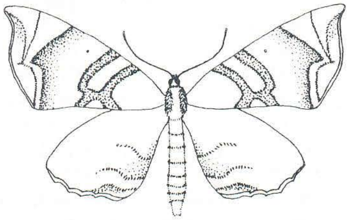
La Selva field station is located in the Atlantic lowlands of northeastern Costa Rica. The property consists of 4300 acres, much of which is virgin rain forest, with a rainfall of 157" per year. There are huge trees having buttresses 15 feet wide and 130 feet high; beneath the canopy there are lush growths of palms, orchids, mosses and ferns. 143 species of butterflies are known from this area. The endangered jaguar also makes his home in the secluded areas of the forest. Our days were spent exploring, but the evening's entertainment was observing night flying beetles and sphinx moths at a special light used for this purpose. It is said that 1 out of 5 living things on this earth is a beetle. The Egyptians believed the beetle to be sacred and when a body was prepared to be mummified, a beetle replaced its silent heart.

The Order Coleoptera (beetles) is the largest in the insect world with 280,000 species, followed by the Lepidoptera with an estimated 120,000 species. Corcovado on the southwest Osa Peninsula, is one of the largest and most recently established national parks and is reserved for scientific study. At present the only way to reach the park is by plane. I was privileged to travel with a group lead by Dr. Mildred Mathias, Professor Emeritus of Botany from the University of California Los Angeles, to study this "world of biological treasures". The early dawn is heralded in by the explosive roar of the howler monkeys, the songs of birds are deafening and then suddenly....morning and there's stillness in the camp. Walking through these woods listening to the many songs will always be one of the most memorable experiences of my life. My greatest thrill was finding one of the largest moths in the world, the "Ghost Moth", Thysania agrippina (Hepialidae), measuring 9 inches across. Only a dedicated enthusiast would be up at 3:00 AM to see them. The curious lottery butterfly (Callocore sp.) are found here. They are brown with big red spots and on the underwings can be seen the numerals 9 and 8.

There is a delicate balance in the tropical rain forest. All that inhabit this world has its own special niche. The competition is enormous and creatures big and small survive with the instincts perfected through millions of years of trial and error. Some only need a small area in which to survive and reproduce, others are more demanding and need many acres of land. Destroying even a small part of a rain forest can destroy a whole group of species. Some butterflies, such as Papilio, Anaea, Morpho and Caligo, need large areas. The species Ithomia bolivia is endemic in the lowland of the Atlantic regions and is found nowhere else in the world.

Developed countries have as great an economic stake in the long-term survival of tropical forests as do the countries in which the forests grow. A very large percentage of the world's oxygen is produced by these forests. These regions serve as a "storage tank" for some 55% odd stored carbon. With deforestation, there would be an increase in atmospheric carbon dioxide and a change in the world climate. Consider the gene pools of flora and fauna stored within these forests and the agricultural and medicinal values yet to be discovered.

We all know that our natural environment is being upset by the change in our way of life. Pollution, chemical contaminants and the extinction of many plants and organisms is a reality. Scientists, researchers and graduate students working at Costa Rica filed stations are helping to find ways to solve these "modern" problems. One can no longer say "Who cares!". It is a matter of life or extinction, and man is no exception.



Eulithis diversilineata 2.3 X

ADVENTURES IN THE SAND... OBSERVING DIGGER WASPS

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You may wonder why someone would want to study sand wasps. Many people think of wasps as obnoxious black and yellow insects that interrupt their picnics or make life interesting while cleaning the roof gutters. Very few wasps are actually pests (pest meaning their interests conflict with ours), and most wasps are solitary, not social as are the yellow jackets and paper wasps. There are many kinds of solitary wasps, but digger wasps are, for the most part, restricted to making their subterranean nests in sandy or gravelly places that are often only partly covered with vegetation. There is much that can be learned by spending a few hours intently watching the wasp fauna at an old gravel pit or waste area.

Many families of solitary sand-inhabiting wasps are generally called sand or digger wasps, but the term is usually applied to the family Sphecidae - a large and diverse group. Also to be found at a sand pit are the Pompilidae (spider wasps), Mutillidae (velvet ants), Tiphiidae and Scoliidae (grub-hunting wasps), Chrysididae (cuckoo wasps), and some Eumenidae (mason wasps). There are also several families of solitary bees that nest in the sand, such as Halictidae, Megachilidae, Anthophoridae, and Andrenidae. Of course, there aren't just Hymenoptera in a sand pit. One can study tiger beetles, ant-lions, robber flies, bee flies, satellite flies, and various Orthoptera. There are always some interesting interactions among the various insects to keep one busy observing for hours at a time.

Not all solitary wasps are ground-dwelling (fossorial). Many genera in the Pompilidae, Eumenidae, and Sphecidae have evolved into aerial nesters, constructing their nests in different ways, but all having the common goal of providing concealment and protection for their offspring. There are a number of mud-daubers (Sceliphron, Trypoxylon (Sphecidae), Auplopus (Pompilidae), Eumenes (Eumenidae), and some twig and cavity nesters (various genera of Pompilidae, Sphecidae, and Eumenidae), and some that simply drag their prey under a flap of bark (Ampulicidae). Miller and Kurczewski (1973) reviewed the ecology of the various nesting strategies of digger wasps. Twig nesting wasps are usually small in size and use many small prey per cell, whereas ground nesters are on the average, larger and more diverse in the type of prey selection.

Ground nesting wasps are most commonly represented by the Pompilidae and Sphecidae. Pompilidae prey on spiders and usually dig their nests after finding and paralyzing a spider which is dragged backwards into the nest. Only one spider per cell is used, and most nests are single celled. The egg is laid on the abdomen, the burrow sealed up, and the female spider wasp sets out to repeat the process.

Sphecidae usually prepare their burrows before hunting prey, although there are a few exceptions. There are eight subfamilies within the Sphecidae, with hundreds of species. Behavioral traits may be consistent within a subfamily, tribe or genus, but it is difficult to generalize the entire family. Nests vary from simple one celled burrows to multi-celled labyrinths that may extend to a meter in depth. Depending on the species, there may be one or many adult or immature prey per cell, and the egg is laid on the first or last prey item brought into the cell. Evans (1963a) summarized the behavioral modifications in the Sphecidae. A survey of the behavior traits of one subfamily, the Nyssoninae, demonstrated the relationships that can be shown by using comparative behavior (Evans 1966).

Solitary wasps have played a major role in shaping the study of animal behavior (see Matthews and Matthews 1978). Because insects are easily approached, have short generation times, and require little equipment for field studies, they have been a favorite of many generations of naturalists. It was not until Jean-Henri Fabre published his Souveniers Entomologique (1897 - 1907) that wasp behavior gained more favor as an exciting field of study. Fabre's books (especially after translation into English) provided the stimulus for subsequent generations of insect behaviorists. The Hunting Wasps (1915) is one of Fabre's most widely read works and is still very absorbing reading. In the U.S., the best early accounts of wasp behavior are those by the Peckhams (1905) and the Raus (1918). These early books did much to generate enthusiasm about wasp ethology, and contain much useful information.

As later workers studied solitary wasps, the trend went from anecdotal writings to gathering data to support theories about about relationships between various groups and the development of social behavior - an evolutionary approach. For a good introduction to modern works on wasp behavior, the following books are highly recommended: Wasp Farm (Evans 1963b), The Wasps (Evans and Eberhard 1970), and The Lives of Wasps and Bees (Andrews 1969). For a more in-depth approach, Evolution of Instinct (Iwata 1976) is an excellent source.

The beginning entomologist often starts out collecting butterflies or beetles perhaps because they are showy, easy to find and because there are many field guides available to identify them. Unfortunately, no field guides exist for wasps in North America. It is for this reason that many will find it difficult to study sand wasps if they can't put a name on the insects they have observed. Even for a professional ethologist this can be a problem, especially in the tropics, where the fauna contains many unidentified species and poorly worked groups. Many wasp ethologists have therefore become taxonomists as a matter of necessity, and some systematists have also become ethologists to better understand the relationships of their animals.

This mixing of taxonomy and behavior has resulted in a more thorough understanding of evolutionary paths and relationships among the different groups. Behavioral differences in some apparently similar looking wasps resulted in taxonomic studies that found two sibling species existed, not just a single variable one as had been supposed before (Miller 1976). Studies such as this underscore the value of behavioral data even more.

To get started on wasp taxonomy, one needs a microscope, and some basic references such as Bohart and Menke (1976) for keys to the genera of Sphecidae. Evans (1950, 1951 a,b) and Townes (1957) have published keys to the spider wasps of North America. Yeo and Corbett (1983) is an excellent guide to British sand wasps, but has limited use for North American fauna, which is far more diverse than Britain's. The recent Hymenoptera catalog (Krombein, et al. 1979) is indispensable if you are doing serious work on ethology or taxonomy, especially if you want to check for previous references.

If you don't feel competent in identifying your own wasps, or lack facilities to do so, remember to label your specimens properly (STATE: County, Township, date, collector at minimum), and keep a field notebook with numbers corresponding to the wasps you have captured (ethology note numbers). A specialist may be able to identify the specimens for you and then you can build a reference collection of local wasps to help identify what you are seeing in the field. Remember to collect a series if possible, so that the taxonomist can retain some for his or her trouble!

Observing sand wasps takes some practice, patience, and preparation. The observational skills will come with experience. You simply cannot walk into a sandpit for five minutes and expect to observe all of the things you have read about. Before you leave disappointed, sit down in a comfortable spot and do nothing but watch for twenty minutes. Look around, examine the undergrowth and flowers for wasp activity. Once you spot a wasp, keep watching it until it is out of sight. Make notes of what you are seeing, either on paper or on a tape. Record the temperature of the air and sand, and the weather conditions. You will later find that recording these bits of information will help piece together the activity patterns of the various species. Use table 1 as a guide for recording your observations.

As you become familiar with your study area, you will find there is a progression of species appearing at discrete intervals during the summer, what time of the day is best suited for some wasps, and which species are found in the different microhabitats. This is a good opportunity to learn something about the plants growing in the area, too. Plant species are good indicators of specific habitats and stages of succession in an area. These are useful in determining the kinds of habitats the various species of wasps are found in. Just as different species of plants inhabit sand dunes and clay areas, the wasps will also be different at each. Find out what species are likely to be found in your region (use Krombein, et al. 1979), activity dates, and what the habitats are. This way you won't be trying to search for a tarantula hawk (pompilidae) in Michigan, or dune species in open deciduous woods.

Observation is the most important activity. It takes practice to see the various wasp activities, just as it does for birds, mammals, etc. Just as good Ornithologists know where to look for a particular species of bird, an Entomologist knows the best habitat for a specific insect. Be patient, observant, and always objective!

Equipping yourself for behavioral studies is fairly simple and inexpensive. At the minimum, you should have the following items in a shoulder or musette-style army bag: 5 x 7 inch bound notebook, writing instrument, ruler, small digging tool, forceps and pocket thermometer. Also handy is a digital stopwatch (they now sell for under US $10.00), an insect net, killing jars, vials, small marking stakes, small bottles of paint or paint pens, and a camera. As you get more experience, you'll know what items are important to take along all the time. A small 1 inch wide putty knife and a hand trowel are good digging tools. For wasps with shallow burrows, a putty knife is the best tool to dig them up with. Work slowly from one side, to avoid losing the cells. Here again is where experience becomes important. Marking wasps is desirable if you want to follow individuals: to observe how many consecutive nests a female may construct, which males are the most successful at mating, or as a way to determine longevity. A spot of paint applied to the thorax is usually sufficient to see from several feet away. Use bright colors to code the animals. For stinging females, it is best to hold them restrained in the insect net while applying a tiny spot of paint. Males can be handled with the bare fingers. This is a good opportunity to tell the sexes apart in the field!

From the previous references, it may seem that everything is already known about solitary wasp behavior. This is far from true, especially at the species level. There are still many gaps in our knowledge, especially for the smaller species. Any new information will help fill in the gaps and give a better understanding of relationships. For example, the genus Mellinus (Sphecidae) contains only a few species world-wide. Yet, only the Palearctic Mellinus arvensis (L.) has been studied in detail (Hamm and Richards 1930, Siri and Bohart 1974). Aside from a brief note (O'Brien 1983) nothing is known for certain about the behavior of the North American species of Mellinus. Often, there is only a single prey record to document a species' behavior, or a species may be well studied in one region, only to be ignored on the other side of the continent, where its behavior may be different in subtle ways. Many species are secretive and are poor subjects for a short-term study, but an amateur with free summers and a practiced eye may discover new information.

The local wasp fauna of a poorly collected area often is of interest to systematists and ethologists. A good collector may reveal new records and range extensions, which is of value to systematists and biogeographers. This is a good opportunity for amateurs to help out the professionals. Phil and Nellie Rau were considered amateurs in that they did not make their living as entomologists. Yet they accomplished a lot with little funding or equipment. Their keen observations, accumulated over hundreds of hours in the field, unraveled the life histories of many species of wasps will be a great legacy to the subsequent generations of wasp watchers. Whether you decide to study solitary wasps just for the fun of it, or as a serious scientific pursuit (it's still fun), you will agree that they are an adventure all their own; each species with its own story!

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TABLE 1. BEHAVIORAL CRITERIA AND VARIABLES

NESTS

Are nests single or multicelled?
What are the dimensions of cells, burrows, tumuli, and closures?
Are nests in sand, gravel, clay, or a combination of different soil types?
Is the soil moist or dry? Is it firm, loose or compacted?
How much vegetation covers the nest site?
Are specific materials used to close the burrow?
Are nests clustered, scattered, or in some pattern influenced by vegetation, soil types, or interspecific interactions?

PREY

What taxa are used as prey?
Are certain life stages preferred?
Where does the wasp sting the prey and how many times?
How is the prey transported by the wasp - mandibles, legs, sting, forwards, backwards, in flight, or on the ground?
Where do the wasps hunt the prey?
What is the sex ratio of the prey, its weight, and or dimensions?
How many prey are utilized per cell?
Where is the egg deposited on the prey?
Is the egg placed on the first or last prey in the cell, or is it laid on a cell wall?

ADULT ACTIVITY

Where do males mate with females?
Do males patrol the best area, flowers, or elsewhere in search of mates?
How many times does a female mate?
Are males territorial? If so, do they defend their territory, and how long are territories retained?
Where do adults get nectar?
How often do they visit flowers, rest, groom, and search for prey?
Do females share nests? Do some wasps usurp nests or steal prey?
Are nests guarded by the males?
How do females prevent parasites from attacking the nests?
Are the wasps gregarious, solitary, or antagonistic towards conspecifics?

ASSOCIATED SPECIES

Are the wasps' provisions attacked by cleptoparasites?
During what phase of the nesting sequence do cleptoparasites oviposit?
What other species of wasps and bees are found in the same habitat?
Is there a significant predation by other insects on the wasps?
Is there competition for nesting sites?
Is there a gradual replacement of one species by another at a specific site over several years?

A HOME EXPERIMENT WITH TRAP-NESTS

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Last spring I read an article by Dr. Karen Strickler in the Y.E.S. QUARTERLY (Fall 1984) about how to make trap-nests for wasps and bees. I thought this would be fun, so I got some plastic straws and bamboo pieces and made some to hang outside my house.

Since I also needed a project for the Science Fair, I thought I would compare the two types of homes to see which ones the wasps liked better. I named this experiment "Wacky Wasp Renters" and I used the scientific method to organize my thinking.

Definition of important terms: (1) **Trap-nest** - a group of tubes made by a person which is hung outside to attract wasps or bees; (2) **Renter wasps** - a solitary wasp that makes no home but moves into a home (trap-nest) you provide.

1. Identify Question (Problem)

What kind of homes do renter wasps like to live in?

2. Formulate a Hypothesis

The renter wasps would prefer the natural bamboo better than the plastic straws for homes.

3. The Experiment

I made 6 plastic straw homes and 13 bamboo homes. I hung them outside early in the summer in locations where I thought wasps were likely to visit. I tried to control any variables by hanging the plastic and bamboo homes closely together, by making sure both types of homes had holes big enough for wasps to live in, and by hanging out the homes at the same time of the year (early summer).

4. Observe and Record

I observed for mud or straw in the opening of the homes. I was able to see a wasp go into a home, and I took a photo of her the next day. I wrote down the dates and times I saw wasps or mud in the homes.

5. Results

No wasp or bee moved into any of the plastic straw homes. Seven (7) of the thirteen (13) bamboo homes were occupied by wasps or bees, as evidenced by the fact they had either mud or straw in the opening (mud plugs usually indicates a wasp, and straw or grass plugs may indicate bees).

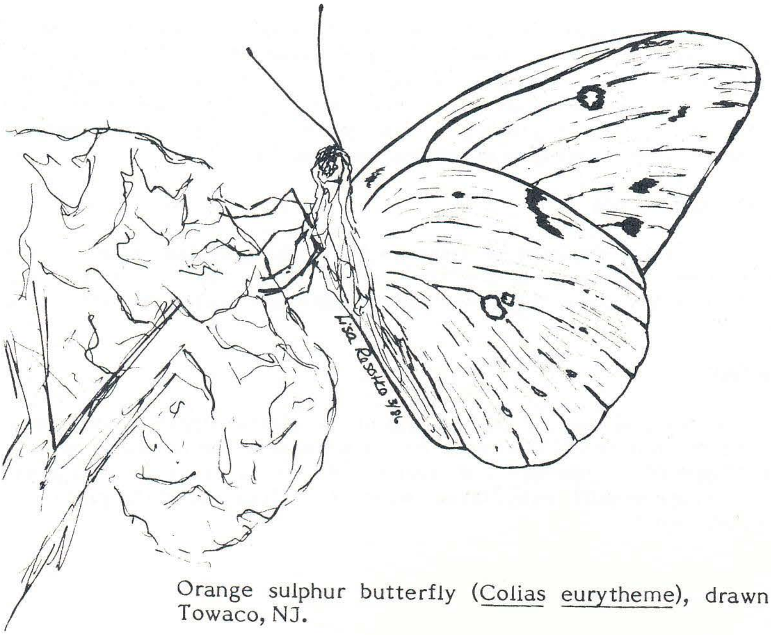
6. Conclusions

The renter wasps preferred the bamboo homes. They did not seem to like the plastic straw homes. I think the plastic homes were not used because they are not made out of natural materials, and they may have smelled differently to the wasp. Also, the inside of the plastic straws was slippery and lighter in color inside than the bamboo homes.

The first wasp to come to one of the bamboo homes came at about our dinner time. Our whole family could watch her from the dining room window. One time when she came, she actually "cleaned out" the bamboo home using her feet like a little broom! We watched her for many weeks. She put mud into the opening of each piece of bamboo. In the early Fall, we decided to capture any "mother" wasps living in the bamboo pieces so that we could identify them. Two of them looked just alike, they were wasps of the family Eumenidae, genus Ancistrocerus. The third one was a big surprise! It was a "plasterer bee" of the family Colletidae, genus Hylaeus.

The second generation have not yet come out of their homes that we are keeping in a fruit jars with net tops. I can hardly wait until they come out so we can see what they are.

I would like to thank Dr. Karen Strickler for her article and letter, Eric Eaton for identification and encouragement, and my brother, Mark, for getting out the ladder every time I had to check my trap-nests.



Orange sulphur butterfly (Colias eurytheme), drawn by Lisa Resotko, Towaco, NJ.

NOTES ON PREDATION AND PARASITISM OF TWO SPECIES OF CICINDELA (COLEOPTERA: CICINDELIDAE)

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Adult Predation:

Tiger beetles adults are known to be voracious predators. This behavior is facilitated by large powerful mandibles and the ability to move quickly. However, these insects are themselves victims of predation by other animals, both vertebrates and invertebrates. There have been numerous reported instances of predation on adult tiger beetles by reptiles, amphibians, birds and mammals (Larochelle 1974, 1975a, 1975b). This was accomplished by analyzing stomach contents and scats of various individual animals. The literature also contains references to predation by several types of insects and spiders. Two personal accounts of predation follow.

In August 1985 I traveled to Metairie, Louisiana to visit a friend of mine, Greg Cenac, who I roomed with for two years at Louisiana State University. On August 17, 1985 we decided to make a 43 mile overnight canoe trip down the Blackwater River in the western part of the Florida panhandle. Frequent stops were made along the pure white riverbanks in search of tiger beetles. Megacephala carolina Linnaeus was encountered infrequently beneath stones and driftwood in gravel soil along the river. Cicindela repanda Dejean, C. blanda Dejean, and C. trifasciata ascendens LeConte were also encountered rather infrequently. By far the most abundant species on the sandy riverbanks was C. wapleri LeConte. This species inhabits extremely white sand which is deposited along the banks of rivers and the moist sand bars near water (Graves and Pearson 1973).

My friend Greg had a hard time catching the fast-flying tiger beetles, but he soon perfected the technique of using an aerial net. At one stop along the river Greg noticed something unusual and called me over to where he was standing. A bright green spider was dragging a C. wapleri LeConte across the white sand very close to the edge of the river. We watched for several minutes as the spider continued to drag the tiger beetle for several feet. I collected what turned out to be a lynx spider, Peucetic viridans (Hentz) (Oxyopidae), and the tiger beetle was apparently already dead but the body had not yet stiffened up. According to Kaston (1978) lynx spiders, as adults, build no snares, retreats, or molting nests, and live among low bushes and herbaceous vegetation to which they fasten their egg sacs and over which they hunt their prey.

Nagano (1980) and Day (1969) both reported instances of black widow spiders, Latrodectus sp. (Theridiidae), feeding on cicindelids. Although we did not see the lynx spider kill the tiger beetle (in fact the beetle may have been dead already and possibly washed ashore by the river current) it is certain that the spider was dragging the beetle as prey. To my knowledge this is the first account of a lynx spider preying on a tiger beetle.

After the canoe trip we drove back to Metairie. I collected a nice series of C. trifasciata ascendens LeConte on the mud flats of Lake Ponchartrain in Jefferson Parish. We then made a trip to Louisiana State University in Baton Rouge. On August 23 we collected tiger beetles on the banks of the Mississippi River adjacent to the University. The level of the river was down considerably and Megacephala carolina Linnaeus were quite common under rocks and driftwood. C. repanda Dejean was common and

Greg collected one C. hirticollis Say. As we walked along the river we frequently startled camouflaged C. repanda Dejean and caused them to fly short distances.

A rather large asilid fly (30 mm) was observed flying in the general area, occasionally attempting to grasp a tiger beetle while in flight. It is generally accepted that asilids are attracted to flying prey. I caused a C. repanda Dejean to fly and almost immediately the asilid grabbed the beetle. I netted both of them in flight. Lavigne (1977) has reported numerous cases of predation by asilids and Graves (1962) observed a large dragonfly (Aeshna interrupta interrupta Walker) capture an individual C. repanda Dejean while both were in flight. A written description of tiger beetle predation by other flying insects can be better appreciated when actual observations are made in the field.

Larval Parasitism:

Tiger beetle larvae are also voracious predators but live in fixed burrows in the soil. Larvae are dependent on prey that by chance approach the burrow. Spines on the fifth abdominal tergum anchor the beetle larva to the burrow wall. This anchoring prevents the larva from being extracted from the burrow by large prey it has attacked.

Earlier in the summer, on June 2, 1985, I drove to a gravel pit in Sennett, New York (Cayuga Co.) in search of cicindelids. The sky became overcast and rain seemed likely. Adult beetles were not active so I decided to collect larvae in an attempt to rear them out in a controlled environment. A total of 41 larvae were extracted from obvious open burrows (mostly third instar). I noticed that three of the larvae (C. repanda Dejean) were being parasitized. This warranted further investigation in the lab.

Two of the beetle larvae had one parasite each, on one larva the parasite was attached to the tiger beetle ventrally between the head and the thorax (Figure 1). On the other beetle the parasite was wedged

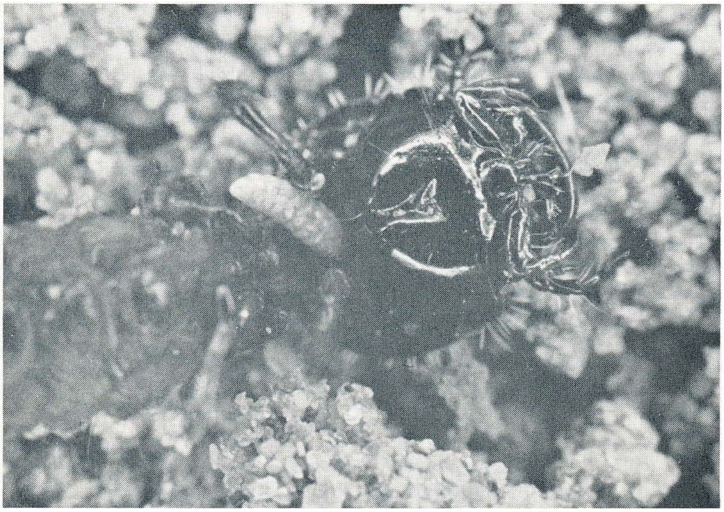

Figure 1. Ventral view of a Cicindela repanda Dej. larva showing a parasitic fly larva (Anthrax sp.) between the head and thorax. (Photo by Carl Palm, SUNY-ESF, Syracuse, New York)

between the first and second abdominal segments. The third tiger beetle was a victim of multiple parasitism, evidently by the same parasite species. Figure 2 shows four of the larval parasites (a fifth parasite is hidden from view). At first I thought these parasites were Methoca stygia (Say) (Hymenoptera: Tiphiidae). Adult females of this species are wingless and were active in the general area. However, according to Wilson and Farish (1973) the female tiphiid wasp stings the beetle, drags the beetle to the bottom of the burrow, lays a single egg on it, and then fully fills the burrow up by transporting bits of soil into it. This description did not fit my observations of open burrows and multiple parasitism.

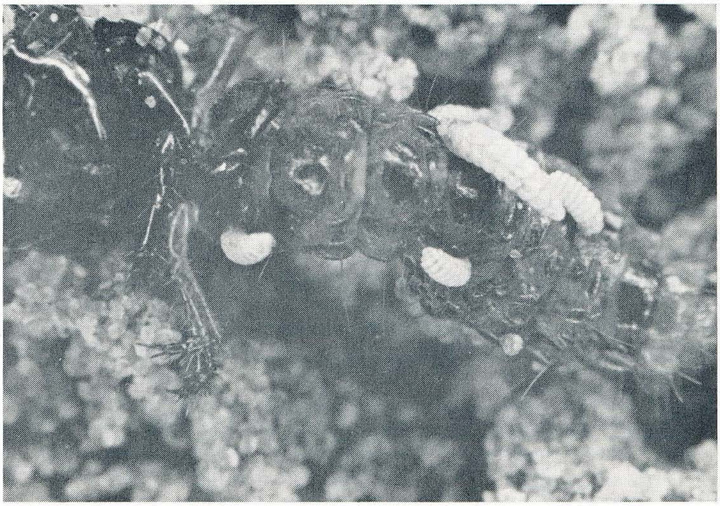

Figure 2. Ventral view of a Cicindela repanda Dej. larva with four parasitic fly larvae (Anthrax sp.) actively feeding. A fifth parasite is hidden from view. (Photo by Carl Palm, SUNY-ESF, Syracuse, New York)

Upon further investigation of the literature and with the advise from Dr. Knisley, closer observations of the parasites revealed they probably belong to the genus Anthrax (Diptera: Bombyliidae). Individual female flies in this genus locate burrows and toss eggs into them (Palmer 1982). After hatching the larvae attach themselves to the beetle larva and remain there until the beetle develops into the prepupal stage (Knisley and Pearson 1984). These descriptions go along well with my field observations. I plan to revisit this site this summer for more detailed observations. I also hope to be able to rear out adult parasites for positive species identification.

Acknowledgments:

I wish to extend my sincere appreciation to Gregory Cenac for assisting in the collection of specimens and for providing transportation to the Blackwater River State Forest and to Louisiana State University. I would also like to thank Dr. Roy Norton at the State University of New York, College of Environmental Forestry, Syracuse, New York, for identifying the lynx spider, Peucetia viridans (Hentz). Thanks must also

be extended to Dr. Barry Knisley, Department of Biology, Randolph-Macon College, Ashland, Virginia, for is identification work on the cicindelid larvae.

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THE HONEY ANTS

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Honey ants are very common but they are very different from other ants. They gather honey and store it; this is where they get their name.

There are about six types of honey ants that live in dry regions. One type is called Myremecocystus mexicanus hortideorum. The generic name Myremecocystus comes from the Greek word "myre", and "cyst", meaning bladder or bag, and refers to the swollen worker ants that store nectar. The species name mexicana refers to the fact that this ant occurs in Mexico and other southern countries near it. The subspecific name hortideorum is Latin and means "the Garden of the Gods", and refers to the area in Colorado where this ant was first seen by Rev. Henry McCook one hundred years ago.

Honey ants need a special environment to live in and they cannot adapt to other environments like other animals can. The honey ant also has a very restricted diet. Worker ants feed dead insects and spiders to their young and collect the yucca capsules and galls from the branches of oak trees. They also collect honeydew, a sweet, sticky substance secreted by a few sucking insects.

Honey ants are usually active at night and this helps them avoid predators and other natural enemies. The ants may travel up to 20 meters from their nests, and only rarely encounter other workers from different colonies. This is because the nests are usually far apart from one another. When honey ants encounter other ants they are likely to capture them as "slaves". Honey ants are not usually aggressive, but they will defend their nests against other insects. They spray them with formic acid.

Honey ants are prey for some predators such as spiders and mites. Some biologists have found these ants in the stomachs of some lizards. Coyotes may dig up the nests of honey ants, but the greatest enemy of these ants is probably man who destroys their nests by building houses and roads.

BUGS FOR LUNCH?

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Having a plate of insects for lunch probably won't appeal to most people. At least not in the United States. In some parts of the world eating insects is a tradition dating back to a time long before John the Baptist made eating locusts and honey famous.

As any praying mantid can "tell" you, insects can be a valuable source of nutrients. Their exoskeletons are composed of chitin, which is essentially a compound composed of sugar and nitrogen. Their muscles are protein, just like the muscles of a cow. Many insects are also rich in fat and carbohydrates. They may not be appetizing to most of us, but insects are good for you!

Other people, from cultures that don't share our prejudice against insects as food, eagerly exploit this abundant source of food. For instance, some Mexican Indians are fond of a type of flour known as "ahualte". Ahualte is made from the ground-up bodies and eggs of backswimmers (Hemiptera: Notonectidae) nand waterboatman (Hemiptera: Corixidae). Farther north, Indians in California made use of several insects for food. One dish was called "koochabe" and was made from the larvae and pupae of the abundant flies which inhabit the brine lakes, such as Mono Lake. Evidently these flies were abundant enough to provide a respectable amount of protein to these first Californians.

Apparently the peoples of the Americas never learned to eat termites. However, in the tropics of Africa, Asia and Australia, eating termites is very commonplace. Termites are easy to locate and are usually found in great numbers. The huge egg-swollen queens are said to be a delicacy roasted or fried. After all, can a million anteaters can be wrong!

Other insects consumed around the world include giant water bugs in Laos, Goliath beetle larvae in central Africa, and migratory locusts in north Africa.

This eating of insects may seem like nothing more than a curious sidelight to the study of entomology. Maybe so, but in these days of drought, famine, and rapid depletion of natural resources, insects may well be turned to as an alternative food source. Before you turn up your nose, consider this: the finest and most expensive condiment used by gourmet French chefs is "Ca Chuong", a secretion produced by a beetle native to North Vietnam. It's worth over a hundred dollars an ounce!

CAUCASUS COLLECTING, 1985

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In company with my wife and Dr. Rataj, I visited the Soviet states of Armenia and Georgia in July, 1985 (7/17 to 7/28). The goal of our expedition was to collect in the vicinity of Lake Sevan. This lake is located in the Low Causcasus, about 70 km north of Erevan, the capital of Armenia. During our stay we twice visited the steppe near the historical villages of Garni and Gechard, which are located south of Erevan. One day we also collected near the wonderful "Valley of Flowers" in Sakchadzor. We collected a lot of different beetles in the mountains near Lake Sevan. Finally, we spent two days in the capital of Georgia - Tbilisi.

Moscow

We started our expedition by flying to Moscow. Before landing near Moscow we saw some large, wet forests of Betula alba and Picea abies. In these forests live the rare and interesting Strangalia nigripes. However, we unfortunately had no opportunity to collect in this area.

Lake Sevan

We were welcomed by tropical-like heat at the airport in Erevan. During our trip to Sevan we stopped and walked out onto the steppe to look at some flowers (family Daucaceae). Here we caught Potosia caucasica and Cetonia aurata pallida. I also found a beautiful Stenocorus sp., which probably came to this place from oaks in the forest at 10 kilometers distance; this genus is very rare in this area. I hoped to collect some of these beetles in the oak forest, but I was not successful in this regard.

Lake Sevan is located at 2100 meters elevation. It is typical of most mountain lakes. The water temperature is never greater than 18 degrees Celsius, even in the hottest summer weather. The air temperature does reach 30 degrees Celsius during the day, though. Mountainous ridges suddenly rise to an elevation of 3000 m near the lake's shoreline. There is a lot of interesting vegetation at the foot of the mountain. In these places I found plenty of beetles from the genera Cetonia and Potosia (more on these beetles later).

Longhorned beetles of the genus Pidonia could be found on the flowers of Ranunculaceae. We caught plenty of Oxythyrea cinctella and O. albopicta on flowers of Rosa sp. and family Daucaceae. Anphicoma sp. could be found on flowers of Papaver orientale. Zabrus aurichauceus and Calosoma (Callisthenes) abreviata were found on the ground at middle and higher elevations.

As we travelled higher up the mountain, the scenery and vegetation changed. Many of the wonderful, colorful plants disappeared and the vegetation acquired an alpine character. We caught Cicindela deseratorum, Dorcadium apicerufum, D. scabricole sevangense, and D. dimidiatum (these are all of the Dorcadium species that occur here). At the time we were collecting we were between the end of the spring generation and beginning of the summer generation. This is why we could collect a lot of species, but only in small numbers.

The climb was difficult and dangerous because of the steepness and the broken stones on which we had to walk. The climb would have been virtually impossible if it were not for the sheep trail we used. The difficult climb was well worth it and we were rewarded by a beautiful view from the top. The whole scene looked like a wonderful flower garden. On the top we collected Carabus varians somcheticus and C. calleyi beneath stones. We also found some specimens of the genera Geotrupes, Stercorosus, Aphodius, Sisiphus and Onthophagus.

We left the top and climbed down to the valley where we met large herds of sheep and cows. The herds were being watched by dogs which are there to protect the animals against wolves and bears. The dogs are also dangerous to people unknown to them, and we had to be careful not to get between the herds and the dogs. Here we saw the beautiful Lilium armeniacum, Papaver orientale and other flowers. On the plant Astragalum we caught the blue-green Sphaenoptera ι etiops and some species of elaterid beetles. These beetles were running quickly along the paths. They were 2 cm long and acted like ground beetles.

Dilijan's Forest

After our mountain climb we went to Dilijan's Forest, which is located within a big valley. The forest is composed of Quercus (oak), Fagus (beech), and Alnus (alder). In spots where there are no trees, plants of the family Daucaceae are abundant. We saw numerous Orchis, too. Slopes were stony and covered with a layer of soil and leaves. We caught Rhagium fasciculatum and Chlorophorus sp., and on blossoms of Heraculeum sp. we found Leptura teserula dejeani. On blossoms of Rosa sp. we found Strangalia spp. We were also pleasantly surprised to capture a beautiful Saperda sp.

Metallic wood boring beetles (Buprestidae) were caught on dead wood, usually inside broken branches. Collecting these beetles is somewhat difficult because they are very active and fly well. We managed to catch only three specimens of Anthaxia sp. We had a similarly difficult time collecting Plagionotus, a longhorned beetle species. They were found running on the broken branches of dead oak trees. If you disturbed them they would fall down into the tall grass where it was impossible to find them.

I maintained twelve pitfall traps in the soil near a small brook in the oak forest. I checked them after ten days and there were only a few specimens of Carabus and some staphylinid beetles.

On our way back we found a beautiful flower with pink blossoms growing in the rock. It was a species of Sempervivum. We were happy to see this flower because we are interested in botany as well as entomology.

The Steppe Near Garni and Gechard

The steppe is placed within a broad valley. From this location we could see the peaks of Little and Big Ararat, which are covered with snow year round. Armenia uses these peaks as the state's symbol. It is also rumored that this is where Noah's ark came to rest.

The steppe was quite dry, but there were some "islands" of green plants: Artemisia, Echinops, Onophorum, Euphorbia, etc. On Onophorum we caught plenty of Potosia hungarica armeniaca, P. caucasica, P. trojana goodetii, P. faustii, and P. funebris. I also caught some species of small carabids. I also succeeded in collecting some Carabus maurus, which is very rare in this place.

The search for beetles under stones was rather dangerous. We discovered two big scorpions and a "spider", Galeodes sp., 7 cm long. It was very brisk and gave out a unique high-pitched tone. It isn't deadly, but its bite can cause a lot of problems.

Here we also saw many green, yellow and red meloid beetles. We also found the cerambycid beetles Plagionotus sp. (on Achilia), three species of Oberea (on Euphorbia), three specimens of Agapanthia sp. (on Onophorum and Echinops), and Pteromalosia albolineata (on Echinops only). In these habitats occur the bigger species of Agapanthia, but since they are dependent on the plant Ferula sp. (which is dead during this season) we could find none. Of the metallic wood boring beetles the most numerous were Miliboeus robustus, Achaeodera sp., and Capnodis metalica. We caught a very large series of Julodis onopordii sovitzii.

Georgia - Tbilisi

The environs near Tbilisi are very interesting for entomologists. Part of the area is covered with forests and there are a few lakes to be found here too. We had very little time to spend here, so we decided to visit a large botanical garden. Here we collected Purpuricenus budensis, Miliboeus robustus, Stargalias spp., and Lepturas sp. After leaving the wonderful scenery of this country I decided I must visit these places again.

Between 1972 and 1986, Dr. Rataj participated in 12 entomological and botanical excursions to Central Asia, to a regions in the Low Caucasus, East Caucasus and North Caucasus. He studied the bionomics and ecology of the genus Potosia and their relationships to the flora of relevant biotopes. Dr. Rataj has added to my article some information on the Potosia sp. which occur in the Low Caucasus.

Potosia caucasica

The center of this species distribution is undoubtedly Armenia. At Lake Sevan I have collected adult beetles, and also larvae and pupae in the rhizosphere of plants from the genus Onopordum at a depth of 5 to 25 cm. These immatures were reared under laboratory conditions. P. caucasica lives from April to August. As mentioned, it prefers Onopordum, but can also be found on the flowers of Heracleum (about 15% of the specimens have been from this plant). The adult beetles have never been collected on Echinops.

Potosia cuprina

This species lives exclusively on Echinops, both the larvae as well as the imagoes. Both this species and the previous have the same geographical distribution.

Potosia faustii

This is a species which is endemic to southwest Georgia and Armenia. It is a very rare species. The larvae develop in the rhizosphere of ther genus Onophordum. The imago occurs from May to early July on the same plant.

Potosia funebris

I have collected P. funebris in masses on Onopordum in Armenia at the locality near Garni-Gechard, on typical steppe. It also develops on Onopordum. This species does not occur at higher altitudes in the sub-mountain areas of the Low Causcasus.

Potosia hungarica armeniaca

This subspecies has an independent area of occurence. I collected it in Armenia at Lake Sevan. It develops in the rhizosphere of Onopordum. Adult beetles live on the same plant and only randomly can be found on other species such as Heracleum and Echinops. The imago lives from April to August with a peak from about 15 June to 10 July. The upper limit of its distribution is 2250 meters.

ACULEATE HYMENOPTERA COLLECTED AT TORREY PINES CALIFORNIA STATE RESERVE

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Torrey Pines State Reserve is located on the Pacific coast, within the northwestern limits of San Diego City. Collecting was conducted in 1983, from March through July and in 1985 from March through September.

Female mutillids were caught with forceps, ants with aspirators, and all others with insect nets. The abbreviations indicate the following: a = abundant, f = frequent, and r = rare. Taxa are arranged in accordance with the Catalog of Hymenoptera in America North of Mexico, Vol. 2 (Smithsonian Institution Press, K.V. Krombein et al., 1979).

David Faulkner obtained the permits necessary for collecting in the reserve. *Liris* species were collected by David Faulkner and John Brown of the San Diego Natural History Museum, Roy Snelling of the Los Angeles Natural History Museum identified many of the specimens and provided access to the Los Angeles Museum's collection. Wojciech J. Pulawski at the California Academy of Sciences identified *Tachysphex* species. Specimens are deposited in the San Diego Natural History Museum's collection.

Order HYMENOPTERA

Division Aculeata

Superfamily Bethyloidea	
Family Bethylidae:	*Goniozus* sp. (r)
Family Chrysididae:	2 undetermined spp (r)
Superfamily Scolioidea	
Family Tiphiidae:	*Paratyphia* sp. (a)
Family Mutillidae:	*Pseudomethoca antracina* (Fox) (f)
	Dasymutilla californica (Radoszkowski) (f)
	D. coccineohirta (Blake) (f)
	D. sackenii (Cresson) (f)
Family Scoliidae:	*Campsomeris tolteca* (aussure) (f)
Superfamily Formicoidea	
Family Formicidae:	*Pseudomyrmex apache* Creighton (r)
	Pogonomyrmex subnitidus Emery (a)
	Veromessor andrei (Mayr) (a)
	Iridomyrmex humilis (Mayr) (a)
	Prenolepis imparis Wheller (a)

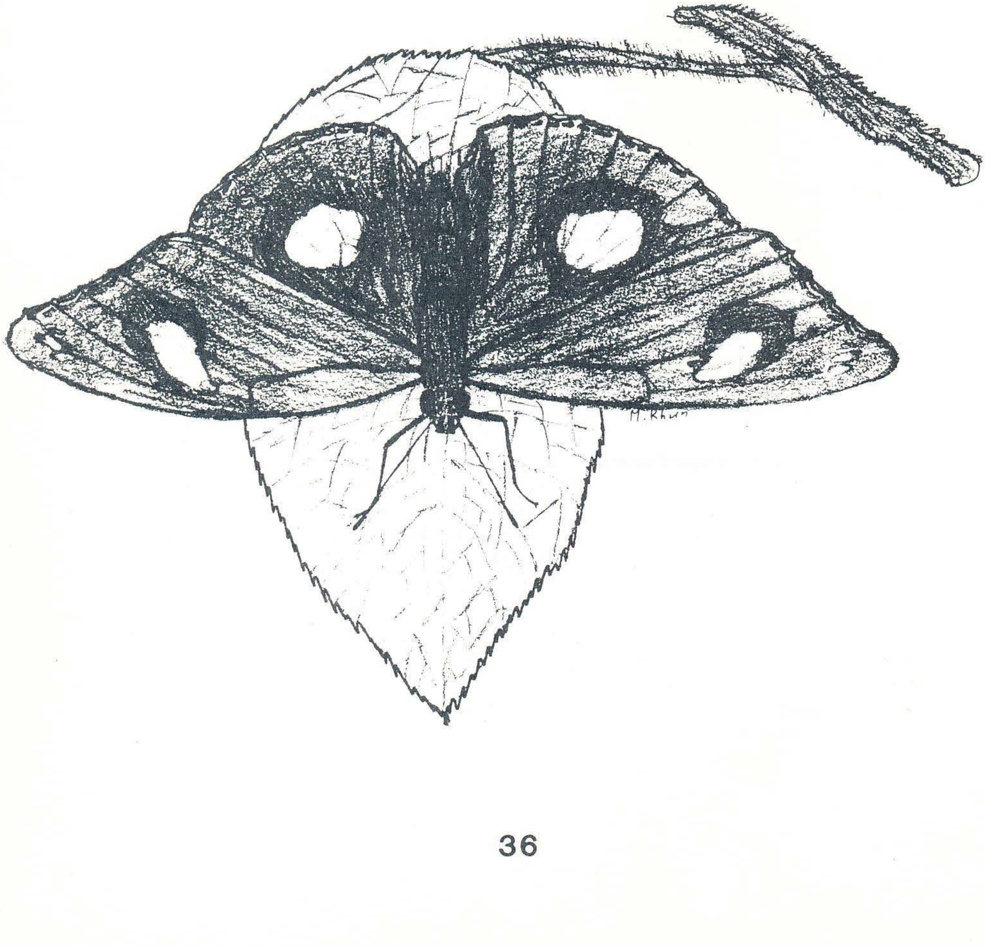
Superfamily Vespoidea	
Family Eumenidae:	*Parancistrocerus declivatus* (Bohart) (a)
	P. mcclayi (Bohart) (a)
	Ancistrocerus spilogaster Cameron (a)
	Eumenes bollii bollii Cresson (a)
	E. crucifera crucifera Provancher (a)
Family Vespidae:	*Polistes fuscatus aurifer* Saussure (a)
	Vespula pennsylvanica (Saussure) (a)
Superfamily Pompiloidea	
Family Pompilidae:	*Pepsis c. chrysothemis* Lucas (f)
	Entypus unifacsiatus californicus (Townes) (a)
	Dipogon calipterus nubifer (Cresson) (f)
	Aporus luxatus (Banks) (a)
	Evagetes padrinus padrinus (Viereck) (f)
	Episyron biguttatus californicus (Banks) (a)
	E. quinquenotatus hurdi Evans (a)
	Poecilopompilus algidus coquilleti (Provancher) (f)
	P. interruptus interruptus (Say) (a)
	Tachypompilus u. unicolor (Banks) (a)
	Anoplius sp. (a)
	Pompilus scelestus Cresson (a)
Superfamily Sphecoidea	
Family Sphecidae:	*Sceliphron caementarium* (Drury) (a)
	Sphex dorsalis Lepeletier (r)
	S. ichneumones (Linnaeus) (a)
	S. lucae Saussure (a)
	Isodontia elegans (Smith) (a)
	Palmodes pacificus Bohart & Menke (r)
	Prionyx thomae (Fabricius) (a)
	Podalonia sp. (r)
	Ammophila aberti Haldeman (a)
	A. cleopatra Menke (a)
	A. macra Cresson (a)
	A. macclayi Menke (a)
Family Pemphredonidae:	*Mimesa sabina* Gittins (f)
	Pemphredon sp. (a)
Family Astatidae:	*Astata mexicana* Cresson (a)
	A. nubecula Cresson (f)
	Dryudella caerulea (Cresson) (a)
Family Larridae:	*Liris beatus* (Cameron) (a)
	L. mescalero latus Krombein & Gingras (a)
	Larropsis tenuicornis (Smith) (a)
	Ancistromma sp. (r)
	Tachytes distinctus distinctus Smith (a)
	Tachyspex aspicalis Fox (a)
	T. ashmeadii Fox (a)
	T. sonorensis (Cameron) (f)

(Family Larridae:)	*Tachyspex*, 3 new species
	Plenoculus propinquus Fox (r)
	Miscophus sp. (a)
Family Crabronidae:	*Oxybelus sericeus* Robertson (a)
	O. uniglumis (Linnaeus) (a)
	Ectemnius lapidarius (Panzer) (a)
	E. spiniferus (Fox) (a)
Family Nyssonidae:	*Nysson* sp. (r)
	Dienoplus pictifrons Fox (a)
	Pseudoplisus californicus Bohart (a)
	P. occidentalis Bohart (a)
	Bembix americana comata Parker (a)
	Stenolia sp. (a)
Family Philanthidae:	*Philanthius gibbosus* (Fabricius) (a)
	P. multimaculatus Cameron (a)
	P. pacificus arizonae Dunning (a)
Superfamily Apoidea	
Family Collectidae:	*Colletes slevini* Cockerell (f)
	Hylaeus mesillae (Cockerell) (a)
Family Andrenidae:	*Andrena auricoma* Smith (a)
	A. caerulea Smith (a)
	A. cerasifolii Cockerell (a)
	A. viridissima Ribble (a)
	A. prunorum Cockerell (a)
	Nomadopsis sp. (a)
	Calliopsis pugionis Cockerell (r)
Family Halictidae:	*Dufourea* sp. (a)
	Agapostemon sp. (a)
	Halictus ligatus Say (a)
	Lasioglossum sisymbrii (Cockerell) (a)
	L. titusi (Crawford) (a)
	Sphecodes sp. (f)
Family Melittidae:	*Hesperapsis nitidula* Cockerell (f)
Family Megachilidae:	*Anthidium collectum* Huard (a)
	Hoplitis g. grinnelli (Cockerell) (a)
	Osmia calla Cockerell (a)
	Osmia sp. (a)
	Megachile frugalis pseudofraglis Mitchell (a)
	Megachile 2 species undetermined (a)

Family Anthophoridae:
Nomada species (undescribed) (f)
Diadasis ochracea (Cockerell) (a)
Melissodes lupina Cresson (a)
Anthophora 2 species undetermined (a)
Emphoropsis sp. (a)
Melecta edwardsii Cresson (a)
Xeromelecta californica (Cresson) (a)
Ceratina acantha Provancher (a)

Family Apidae:
Bombus crotchii Cresson (a)
B. edwardsii Cresson (a)
B. vosnesenskii Radoszkowski (a)
B. californicus Smith (a)
B. sonorus Say (a)
Apis mellifera Linnaeus (a)

Australian egg fly (Hypolimnas bolina), male. The females of this species vary greatly, a type of variation known as polymorphism. The males, however, are nearly all alike. Drawing by Mark Khun, Reno, NV.



FIELD NOTES ON THE EASTERN BLACK SWALLOWTAIL BUTTERFLY

Papilio polyxenes asterius
(Lepidoptera: Papilionidae)

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During some trips to a nearby field in the summer of 1985, I discovered several caterpillars of the eastern black swallowtail feeding on poison hemlock (Conium maculatum). Also, for the first time I found one of these caterpillars on wild carrot (Queen Ann's Lace), Daucus carota. Although I have known for some time that Queen Ann's Lace was one of the several foodplants of the black swallowtail butterfly, in the past I have never been able to find them on this plant! The reason for this was not clear to me. The observations I gathered last summer were very rewarding.

Experience has taught me that some female butterflies prefer to oviposit on foodplants which grow along or near the borders of water courses such as rivers, creeks, ponds, etc. Apparently during summer, high humidity in the air surrounding foodplants is an important element to growing caterpillars. Therefore, please observe in the following fieldnotes that all caterpillars were on foodplants growing along a river bank area.

17 May - Timber Truss field -- Watched a female black swallowtail laying eggs on poison hemlock growing along a riverbank. Poison hemlock grows up to six feet tall and the hollow, grooved stems are spotted with purple. When bruised it has an unpleasant odor. The small white flowers are in umbels (1 to 3 inches across) and they attract many kinds of small insects. Poison hemlock is a member of the parsley family; this plant is very poisonous to humans and cattle, so please don't eat or taste any part of this plant!

Poison hemlock often grows along riverbanks and is a fairly good plant to observe when bug-watching. The blossoms attract insects such as the rose chafer, Pennsylvania leather-wing beetles, ladybird beetles (Coccinellidae), spring azure butterflies, and numerous small insects.

31 May - Timber Truss field -- Found another black swallowtail caterpillar on poison hemlock growing along a river. This was a small brownish caterpillar with a "white spot" or "saddle" in the middle of its body. Amazingly, when I first spotted the caterpillar on the foliage of the poison hemlock it was motionless and looked just like a bird dropping!
As the young caterpillars mature they turn into a very attractive green color with black bands containing yellow spots.

16 June - Timber Truss field -- Sometimes nearly matured green and black caterpillars may be observed feeding on poison hemlock during mid-day or late evening hours. They seem to favor those foodplants located along riverbank borders. The green and black-banded caterpillars have perfect coloration for camouflage. This coloration is very concealing among the foliage of the poison hemlock.

24 July - Timber Truss field -- Discovered the caterpillar of a black swallowtail butterfly on Queen Ann's Lace growing along the riverbank area. This is the first time I have found this caterpillar on Queen Ann's Lace. In past searches for these caterpillars on Queen Ann's Lace growing in dry fields and along roads, I had always been unsuccessful. Therefore, I was excited to surmise that perhaps it is Queen Ann's Lace which grows along watercourses that are most likely to yield caterpillars.

Queen Ann's Lace is a distinctive and common wildflower of the fields and its flat-topped, white blossoms can be seen almost everywhere during the summer. These blossoms lend a certain charm and beauty to the summertime landscape. However, they do not attract a great deal of attention from insects. Some of its blossom visitors include rose chafers, tachinid flies (Tachinidae), and tumbling flower beetles (Mordellidae).

Conclusion -- During that summer I found more black swallowtail caterpillars on poison hemlock than I did on Queen Ann's Lace. Perhaps these swallowtails gain more protection from enemies by feeding on poison hemlock then they do when feeding on Queen Ann's Lace.

I reared several caterpillars in captivity, and I thought they were somewhat "high-strung", as they were easily disturbed and displayed quick, jerky movements. I found it was best to avoid disturbing them, so that they could feed and grow well. I raised my caterpillars in large mayonnaise jars placed on their sides. I reared the caterpillars singly and in such a way as to provide sufficient humidity but adequate ventilation at the same time. Later, when the caterpillars were ready to pupate, I set the jar up vertically and suspend the foodplant on the edge of the jar rim so they could pupate on the foodplant. It is important to change the foodplants daily, and to wash them in water before feeding. Never allow mold to grow on the foodplants, and don't allow too much condensation to build up inside the jar.

It is hard to resist touching swallowtail caterpillars at least once or twice because they will display "orange horns" on top of their heads (which produce a peculiar, odorous defensive fluid). This defensive display is intended to discourage natural enemies such as birds and parasites. It is fun to witness this curious defensive display, and I personally don't find the odor too offensive (its almost pleasant smelling)!

FOODPLANTS OF THIRTY SIX WORLDWIDE SATURNIIDAE (LEPIDOPTERA: SATURNIIDAE)

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The following is a list of foodplants for one of the most popular families of Lepidoptera: Saturniidae, the giant silk moths. These moths are favorites with rearers and breeders because for the most part they are easy to work with and very interesting, both for their colors and enormous sizes. This list includes some of the most popular species for this family. Also included are some updated foodplant listings for a few species of Citheroniiidae.

The information contained in this list has been a great help for me in selecting foodplants for the larvae that I wish to rear. I hope the readers of this list also find it helpful. The format I have chosen is based on one suggested to me by Stephen Spomer of Lincoln, Nebraska. I would also like to thank Craig Odegard of Missoula, Montana, for helping me with the common names.

There has been a great deal of concern towards giving references for the foodplants I state in these lists. Unless otherwise noted, the source of my information is Paul Willard's book, "Moths and How to Rear Them". All other information on food plants is footnoted, and the numbers coincide with the list of authors, collectors, and companies at the end of this article.

This will probably be the last list in my series on foodplants for lepidopterous larvae. Every effort has been made to make this list as accurate and informative as possible. I would like to thank everyone who helped me by supplying information. I would appreciate any errors being brought to my attention, and I encourage correspondence from any person interested in Saturniidae.

(1) *Actias artemis* Bremer & Grey, Japanese moon moth - apples (*Malus*), apricots, plums and cherries (*Prunus*), black alders (*Alnus*), maples (*Acer*), pears (*Pyrus*), birches (*Betula*), pomegranates (*Punica*), walnuts (*Juglans*), oaks (*Quercus*), beeches (*Fagus*), hickories (*Carya*), and chestnuts (*Castanea*).

(2) *Actias luna* Linnaeus, Luna moth - hickories (*Carya*), walnuts (*Juglans*), birches (*Betula*), oaks (*Quercus*), pecans (*Carya*), aspens (*Populus*) (Watson & Whalley 1975), willows (*Salix*), butternut (*Juglans cinerea*), sweetgums (*Liquidamber*), persommons (*Diospyros*), beeches (*Fagus*) (Remington 1975), American sycamore (*Platanus occidentalis*) (Watson & Whalley 1975), chestnuts (*Castanea*).

(3) *Actias selene* Hubner, Indian moon moth - apples (*Malus*), cherries (*Prunus*), moonwort (*Andromeda glaucophylla*), rhododendron (*Rhododendron*), walnuts (*Juglans*), willows (*Salix*), sweetgums (*Liquidamber*) (Downey, pers. comm.), lilacs (*Syringa*) (*Robinette*, pers. comm.), privets (*Liqustrum*) (Downey, pers. comm.), plums (*Prunus*) (Watson & Whalley 1975), pears (*Pyrus*) (Watson & Whalley 1975), and hawthorns (*Crataegus*) (Watson & Whalley 1975).

(4) Agapema galbina Clemens, galbina moth - greasewoods (Larua) (Arnett & Jacques 1981).

(5) Aglia tau Linnaeus, Tau Emporer - beeches (Fagus), limes (Tilia), oaks (Quercus), birches (Betula), walnuts (Juglans), sycamores (Platanus), black alders (Alnus), chestnuts (Castanea), lindens (Tilia), and maples (Acer).

(6) Antheraea assamensis (assami), Muga silk moth - oaks (Quercus), apples (Malus), and live oak (Quercus virginiana).

(7) Antheraea loranthi Lucas - mistletoes (Viscum) (Watson & Whalley 1975) and eucalyptuses (Eucalyptus) (Watson & Whalley 1975).

(8) Antheraea mylitta, tusseh silk moth - oaks (Quercus), beeches (Fagus), hornbeams (Carpinus), and plums (Prunus).

(9) Antheraea paphia, tussore silk moth - oaks (Quercus) and possibly willows (Salix).

(10) Antheraea pernyi Guerin-Meneville, Chinese oak silk moth - apples (Malus), oaks (Quercus), birches (betula), hornbeam (Carpinus), chestnuts (Castanea), plums (Prunus), and willows (Salix) (Downey, pers. comm.).

(11) Antheraea polyphemus Cramer, polyphemus moth - oaks (Quercus), birches (Betula), elms (Ulmus), lindens (Tilia), maples (Acer), chestnuts (Castanea), cherries and plums (Prunus), willows and osiers (Salix), alders (Alnus) (Milne and Milne 1980), hawthorns (Crataegus), hickories (Carya) (Milne and Milne 1980), basswoods (Tilia) (Milne and Milne 1980),poplars (Populus) (Milne and Milne 1980), sycamores (Platanus) (Holland 1968), wild roses (Rosa) (Holland 1968), beeches (Fagus) Holland 1968), horsechestnuts (Aesculus) (Robinette, pers. comm.), and dogwoods (Cornus) (Downey, pers. comm.).

(12) Antheraea yamamai Guerin-Meneville, Japanese oak silk moth - oaks (Quercus), chestnuts (Castanea), apples (Malus), plums (Prunus), beeches (Fagus), hickories (Carya), and mulberries (Morus).

(13) Antheraea mittrei Guerin-Meneville, tailed comet moth - poison ivies (Toxicodendron), pepper tree (Scinus molle), mimosas (Mimosa), dwarf sumac (Rhus copallina), staghorn sumac (Rhus typhina), Eugenia cuneiforlia and Weinmannia eriorcampa.

(14) Attacus atlas Linnaeus, atlas moth - lilacs (Syringa), ashes (Fraxinus), sassafrasses (Sassafras), privets (Ligustrum), ailanthuses (Ailanthus), cherries and plums (Prunus), rhododendrons (Rhododendron), mountain laurel (Kalmia), apples (Malus), poplars (Populus) and willows (Salix).

(15) Automeris io Fabricius, Io moth - corns (Zea), wild cherries (Prunus), lilacs (Syringa), willows (Salix), sassafrases (Sassafras), Poplars (Populus), box elders (Acer), elms (Ulmus), cottons

Gossypium), birches (*Betula*), oaks (*Quercus*), maples (*Acer*) (*Butterfly Co./, pers. comm.*), roses (*Rosa*) (Mitchell and Zim 1964), basswoods (*Tilia*) (Robinette, pers. comm.), tuliptree (*Liriodendron tulipifera*) (Robinette, pers. comm.), walnuts (*Juglans*) (Robinette, pers. comm.), sweetgums (*Liquidamber*) (Robinette, pers. comm.), persimmons (*Diospyros*) (Robinette, pers. comm.), privtes (*Ligustrum*), limes (*Tilia*), and hawthorns (*Crataegus*).

(16) *Callosamia angulifera* Walker, tulip tree silk moth - tuliptree (*Liriodendron tulipifera*) (Holland 1968).

(17) *Callosamia promethea* Drury, promethea moth - lilacs (*Syringa*), wild cherries (*Prunus*), sassafrases (*Sassafras*), privtes (*Liqustrum*), ashes (*Fraxinus*), willows (*Salix*), tuliptree (*Liriodendron tulipifera*), poplars (*Populus*), spicebushes (*Lindera*), sweetgums (*Liquidamber*), button bushes (*Cephalanthus*), maples (*Acer*), basswoods (*Tilia*), barberries (*Berberia*), birches (*Betula*), and mountian laurels (*Kalmia*).

(18) *Citheronia brissottii*, spined devil moth - walnuts (*Juglans*), hickories (*Carya*), butternuts (*Juglans*), and pecans (*Carya*).

(19) *Citheronia mexicana* Grote & Robinson, mexican walnut moth - walnuts (*Juglans*) and hickories (*Carya*) (Robinette, pers. comm.).

(20) *Citheronia regalis* Fabricius, royal walnut moth - smooth sumac (*Rhus glabra*), shining sumac (*Rhus copallina*), mountain sumac (*Rhus cismontana*), willows (*Salix*), oaks (*Quercyus*), hickories and pecans (*Carya*), butternuts (*Juglans*), sweetgums (*Liquidamber*) (Milone and Milne 1980), black gums (*Nyssa*), ashes (*Fraxinus*) (Milne and Milne 1980), persimmons (*Diopyros*) (Downey, pers. comm.), bush honeysuckles (*Diervilla*) (Robinette, pers. comm.), cottons (*Gossypium*) (Watson and Whalley 1975), lilacs (*Syringa*) (Robinette, pers. comm.), and sycamores (*Platanus*).

(21) *Citheronia sepulchralis* Grote & Robinson, pine devil moth - pines (*Pines*) (Robinette, pers. comm.).

(22) *Citheronia splendens* Druce - walnuts and butternuts (*Juglans*), hickories and pecans (*Carya*), pepper tree (*Schinus molle*) (Robinette, pers. comm.), and cottons (*Gossypium*) (Watson and Whalley 1975).

(23) *Eacles imperialis* Drury, imperial moth - maples (*Acer*), sassafrases (Sassafras), boxelders (*Acer*), pines (*Pinus*), beeches (*Fagus*), hickories (*Carya*), oaks (*Quercus*), sumacs (*Rhus*), sycamores (*Platanus*), elms (*Ulmus*), cherries (*Prunus*), and sweetgums (*Liquidamber*) (Downey, pers. comm.).

(24) *Eudia pavonia* Linnaeus, emperor moth - roses (*Rosa*), raspberries (*Rubus*), hawthorns (*Crataegus*), apples (*Malus*), plums (*Prunus*), whitethorns (*Prunus*), blackthorns (*Prunus*), heathers (*Calluna*), sallows and willows (*Salix*), birches (*Betula*), purple loosestrifes (*Lysimachia*), blackberries (*Rubus*), alders (*Alnus*), meadow sweet

(*Spirea alba*), ashes (*Fraxinus*), hops (*Humulus*), and bilberries (*Vaccinium*) (Robinette, pers. comm.).

(25) *Hylophora cecropia* Linnaeus, cecropia moth - lilacs (*Syringa*), ashes (*Fraxinus*) (Milne and Milne 1980), elms (*Ulmus*) (Milne and Milne 1980), wild cherries (*Prunus*), willows (*Salix*), osiers (*Salix*), plums (*Prunus*), apples (*Malus*), maples (*Acer*), alders (*Alnus*), pecans (*Carya*), button bushes (*Cephalanthus*), elderberries (*Sambucus*), boxelders (*Acer*), and birches (*Betula*) (Mitchell and Zim 1964).

(26) *Hyalophora columbia* Smith, Columbian silk moth - larch (*Larix*) and possibly chokecherry (*Prunus virginiana*).

(27) *Hyalophora euryalis* (*Rubra*) Boisduval, ceanothus silk moth - lilacs (*Syringa*), wild cherries (*Prunus*), apples (*Malus*), maples (*Acer*), manzanitas (*Arctostaphylos*), California coffeeberry (*Coffea*), birches (*Betula*), pepper tree (*Schinus molle*), buttonbushes (*Cephalanthus*), ceanothuses (*Ceanothus*), osiers and willows (*Salix*) (Watson and Whalley 1975), and plums (*Prunus*).

(28) *Hylophora gloveri* Strecker, Glover's silk moth - lilacs (*Syringa*), willows (*Salix*), wild cherries (*Prunus*), osiers (*Salix*), privets (*Ligustrum*), alders (*Alnus*), maples (*Acer*), wild currants (*Ribes*), chokecherry (*Prunus virginiana*), buffalo berries (*Sheperdia*), boxelder (*Acer*) (Mitchell and Zim 1964), and Russian olive (*Elaegnus angustifolia*) (Downey, pers, comm.).

(29) *Philosamia cynthia* Drury, Cynthia moth - ailanthuses (*Ailanmthus*), privtes (*Ligustrum*), lilacs (*Syringa*), plums (*Prunus*) (Conlan, pers. comm.), ashes (*Fraxinus*), sassafrases (*Sassafras*), castor beans (*Ricinus*), cherries (*Prunus*), and willows (*Salix*).

(30) *Rhodinia fugax* Butler, squeeking silk moth - chestnuts (*Castanea*), oaks (*Quercus*), black alders (*Alnus*), hackberries (*Celtis*), cherries (*Prunus*), maples (*Acer*), plums (*Prunus*), sycamores (*Platanus*), phellodendrons (*Phellodendron*) (Watson and Whalley 1975), and willows (*Salix*).

(31) *Rothschildia jacobaea*, Rothschild's atlas moth - privets (*Ligustrum*) and possibly lilacs (*Syringa*).

(32) *Rothschildia orizaba* Westwood, orizaba silk moth - privets (*Ligustrum*), lilacs (*Syringa*), button bushes (*Cephalanthus*), ashes (*Fraxinus*), sassafras (*Sassafras*), plums (*Prunus*), willows (*Salix*), pepper tree (*Schinus molle*), cherries (*Prunus*), and apricots (*Prunus*).

(33) *Rothschildia speculifera* - cherries (*Prunus*), lilacs (*Syringa*), button bushes (*Cephalanthus*), ashes (*Fraxinus*), and privets (*Ligustrum*).

(34) *Saturnia albofasciata* Johnson - snowbushes (*Ceanothus*) (Watson and Whalley 1975), and mountain mahoganies (*Cercocarpus*) (Watson and Whalley 1975)

(35) Saturnia mendocino Behrens, Mendocino moth - manzanitas (Arctostaphylos) (Watson and Whalley 1975), sumacs (Rhus) (Watson and Whalley 1975), ceanothuses (Ceanothus) (Watson and Whalley 1975), and arbutuses (Arbutus) (Watson and Whalley 1975).

(36) Saturnia pyri Denis & Schiffenmuller, great peacock moth - ashes (Fraxinus), privets (Ligustrum), cherries (Prunus), birches (Betula), pears (Pyrus), apples (Malus), plums (Prunus), hops (Humulus), horse chestnuts (Aesculus), limes (Tilia), elms (Ulmus), poplars (Populus), and almonds (Prunus).

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INEXPENSIVE INSECT LABELS

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Labels are an essential part of any insect collection. In fact, labels are usually more important than the specimens themselves. Museums refuse to accept material without complete data, and frequently dispose of old specimens that lack it. Pinned insects are meaningless and worthless without knowledge of the location and date of collection. Other information such as host, habitat, altitude, and time of collection further describe the niche of a species and increases the specimen's value to entomologists. From the labels of many individual specimens, taxonomists and ecologists are able to determine geographical and altitudinal ranges, seasonality, diet activity, bait preference, and other bionomic parameters.

Proper insects labels are too small in size to permit legible handwriting. It is also very time consuming to write a large number of labels for large insect series. Museums and other institutions with large collections have their labels prepared by professional printers. This process requires weeks to months, and labels of this quality are too expensive for the occasional collector to afford. A few entomological supply companies do sell labels, but these are also moderately priced with a long wait.

Today, with the abundance and common use of paper copy machines, museum quality insect labels can be prepared by the part-time entomologist for much less the cost and within a few days. The collection data should be neatly typed onto standard 8 and 1/2 by 11 inch paper, with four columns per page, and then copy-reduced to the proper label size at a cost of US $.10 to $.50 per reduction. A double reduction of 67% each is usually needed. The result is often a clear and detailed label, depending on typewriter clarity and the quality of the copy machine. Subsequently, six or more of these page reductions can be taped on a single sheet of paper from which any number of copies can be made onto light-weight cardboard (cost US $.10 to $.25 per sheet), suitable for insect labels. I have successfully made several hundred sheets of insect labels for thousands of insects by this procedure. Hopefully other entomologists will find this informative and useful in upgrading their collections.

CARNIVOROUS PLANTS

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Usually it's the insects which eat the plants, but sometimes it's the other way around! To adapt to adverse environmental conditions, some plants have become carnivorous, feeding mainly on insects.

Most carnivorous plants inhabit swamps, marshes, and bogs. These areas are characterized by very acid soils. These acid soils usually have very low levels of nitrates and phosphates which plants need for their survival. To obtain the nutrients which are lacking in the soil, some plants have evolved ways to obtain nourishment from insects.

There are three major groups of insect-eating plants - the Venus flytraps, the sundews, and the pitcher plants. Probably the most familiar is the Venus flytrap. This small plant is found only in wetlands in North and South Carolina.

The Venus flytrap catches its prey of small insects with specialized leaves. These leaves, which resemble the two jaws of a bear trap, are bright red and have cells that secrete a sweet smelling nectar which attracts the insects. If a visiting insect triggers small hairs inside the trap, the two sides of the leaf come together rapidly trapping the insect inside. Powerful enzymes are then secreted which digest the insect. After about two weeks the meal is fully digested and the leaf opens up again, ready to snare its next meal.

More common, but less familiar, are the sundews. These tiny plants are found in marshy areas all over the world, although it is rare for them to be found in great numbers. Sundews have specialized leaves which are covered with hundreds of tiny tentacles, each of which is tipped with a droplet of sticky liquid. Like the Venus flytrap, the sundew secretes a nectar to attract insects. When an insect lands on the leaf, it quickly becomes mired in the sticky tentacles. The tentacles curl around the insect, soon engulfing it. The leaf then begins to digest its meal much like the Venus flytrap.

The last group is the pitcher plants. These are the largest of the carnivorous plants, some reaching over a foot in height. Pitcher plants do not actively catch their prey like the other insect eating plants. Their insect trap consists of cup-shaped leaves filled with water and strong digestive enzymes. Like the other plants, pitcher plants attract prey with nectar. When an insect lands at the leaf's opening it is attracted to the scent further down inside the cup. Once inside slippery, downward pointing hairs allow the insect to go farther down inside the leaf, but prevent it from backing out. Eventually the insect tumbles into the pool of liquid at the bottom of the leaf. Over time the insect dissolves and the nutrients are absorbed by the plant.

There are some insects which have managed to turn the tables on the pitcher plant, however. Some species of mosquito manage to complete their development in the plants reservoir, despite the strong digestive fluids. There is also a fly whose larva lives inside the pitcher plant and feeds on the insects that would otherwise feed the plant. As always, if there is an unusual way to "make a living", there will be an insect doing it!

BOOK REVIEWS

ENCYCLOPEDIA OF INSECTS

Encyclopedia of Insects. Christopher O'Toole, editor. 1986 Facts On File Publication, New York, NY. ISBN 0-8160-1358-6 143pp, 11 x 9", cloth. US $24.95

At initial glance, it is difficult to believe that such a thin book (it's only one-half inch thick) could be encyclopedic in nature, especially when you consider the size of the insect world! The old adage "You can't judge a book by its cover" is certainly true for this book because its bursting with full-color illustrations and factual, informative text.

The book is edited by Peter O'Toole (University Museum, Oxford) with assistance from advisory editors Prof. Thomas Eisner (Cornell University, USA) and Dr. Borge Petersen (Copenhagen University, Denmark), and 21 other special contributing authors. This team effort definitely paid nice dividends in the production of this reference book.

This book is intended as a general reference work on the insect (and related arthropod) world. The book contains chapters on "What is an Arthropod?", "Millipedes and other Myriapods", "Insects and other Hexapods" (including the power of flight, pheromones, and most major insect groups), and "Arachnids" (scorpions, ticks and mites, and spiders). It also contains an excellent bibliography (categorized into general, regional and major groups listings), a resonably complete glossary, and an index.

There are three things I especially like about this book. First, you can't help but like the 160 full color illustrations (drawings and photographs). The photographs are spectacular, and they emphasize the "exotic", highly colorful tropical insects. However, the photographs appear to have been chosen very carefully, as they are intended to compliment the information in the text, as well as to captivate the eye. Each illustration has a thorough, insightful caption that gives a complete story on the significance of that illustration. Secondly, I like the "ecological theme" that runs throughout the entire book. This book puts insects into the proper prospective by showing them as important functioning participants in various ecosystems around the world. The book is full of interesting information on insect behavior, mimicry, camouflage, warning colors, predation, etc. Thirdly, I like the special ,highlighted boxes' inserted into various parts of the text. These highlighted boxes are designed to stand out from the remainder of the text, and they contain encapsulated tidbits of information on a singular topic. For example, the Coleoptera section contains a highlighted presentation on the features of Coleoptera, the relationship to Strepsiptera, chemical warfare, basic beetle classification, and partners in destruction.

This book is not without a few minor imperfections, such as confusion between nymphs and larvae when talking about immature cockroaches and the distinction between superfamily level and family level classification in the Hymenoptera. However, these few problems in no way detract from the overall usefulness of this reference book.

The book does an excellent job of covering a broad range of topics, and goes well beyond classification and basic biology of insects and related arthropods. I can see why this book has been chosen as an "Outstanding Reference Book of 1985" by the American Library Association. As an entomologist, I also think this book is a good reference and an excellent buy for the money (only US $24.95, which is quite reasonable for a hardbound, full color book). If you are looking for a book with outstanding color pictures, plus good text with insight into a variety of interesting topics, this book is for you!

(Available from Facts On File, Inc., 460 Park Ave. South, New York, NY 10016 (212) 683-2244.)

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GRZIMEK'S ANIMAL LIFE ENCYCLOPEDIA
VOL. 2: INSECTS

Grzimek's Animal Encyclopedia Volume 2: Insects. Edited by Bernhard Grzimek. 1984 (English translation) Van Nostrand Reinhold, New York, NY ISBN 0-442-23036-2 630pp, 7 x 9", paper (US$ 24.95).

This book is part of a 13 volume series on the animal Kingdom. The book was originally published in Germany in 1968 and was translated and published in paperback in 1984. The list of editors and scientific consultants who participated in the preparation of this series reads like a who's who of the world's top scientists and naturalists. There are no less than 15 entomologists and science consultants involved in Volume 2 (Insects).

The volume on insects contains chapters on The Insects, The Primitive Insects, Mayflies, Dragonflies, and Damselflies, Stoneflies, Grylloblattids, Grasshioppers and Allies, Walkingsticks, Mantids, and Cockroaches, Termites, Earwigs, Webspinners, and Zorapterans, Lice, Thrips, True Bugs, Cicadas, Hoppers, Whiteflies, Aphids, and Scales, Dobson flies, Lacewongs, Snakeflies, and Antlions, Beetles, Weevils, and Stylopids, Caddisflies, Butterflies, Skippers, and Moths, Scorpionflies, Hymenoptera: Sawflies, Ichneumons, and Their Relatives, Hymenoptera: The Aculeate Wasps, Ants, and Bees, Diptera I: The Mosquitoes and Their Relatives, Diptera II: The Flies, and Fleas. Their are also several appendices and an index.

Each chapter is written by a distinguished entomologist specialized in the appropriate insect group or other topic. Because of the collaborative nature of this volume there is a degree of variation in the writing styles. Also, since this is a translated work, there is a certain degree of awkward working due to the disparity between the two languages.

In my opinion this book would be most useful to those persons with more than a casual interest in insects, not because of the complexityof the language, terminology or topics, but merely because of the depth of the discussion. Most of the discussions are thorough and comprehensive, and although not complete with every last detail, may give more information than the casual reader might desire. For those people who want stimulating reading on the latest developments in entomological research and opinion, this book would be ideal. I especially like the details given on the habits and behavior of many insects groups and species. This information could be quite valuable to the person looking for new ideas on how to collect or study insects. There also is continuity between the various chapters (different authors, remember!) and a good deal of cross-referencing between the introductory and the systematic chapters.

The book is provided with many, many excellent color photographs and illustrations. The illustrations were carefully selected to demonstrate variation in the insects world. In most cases, common or drab species are not included in the selection. For the most part it appears that non-North American species have been used. The placement of these color plates is in my opinion a little awkward. The color plates are inserted at regular intervals (no doubt an attempt to keep the cost of reproducing with expensive color illustrations to a minumum), but the result is that you may be reading about butterflies and looking at pictures of beetles on the adjacent page! However, if I were given the choice of cutting back on the number of plates, or leaving them as is, I would opt to leave them as is.

The space (margin) to the side of the text is reserved for line drawings that accompany the text and for subject summary headers. This greatly facilitates the task of locating specific discussions or for ascertaining the direction the discussion is "flowing". This system is gaining popularity is contemporary science writing, so I am sure we will see more of it in future publications.

The book contains an extensive 24 page systematic outline of the Class Insecta. All of the species discussed in the text or illustrated in the plates or figures can be accessed through this list as it is completely cross-referenced. I find it odd that the discussion on the hierarchical (Linnaean) system of animal classification is presented after (and not before) this section! The general index is also excellent, and can be used to locate information on any insects discussed or figured in the book.

The book contains a number of appendices that will be of special interest to Y.E.S. members (because of our international scope). There is a list of supplemental readings with a special list of German entomological books and scientific journals. There is a metric conversion table, as well as an English-German-French-Russian dictionary to insect names. That last item is surely unique!

This book is available exclusively from I.S.B.S., Inc., 5602 N.E. Hassalo Str., Portland, OR 97213-3640 for US$ 24.95 (paper) or $42.50 (cloth) plus $2.25 postage and handling.

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The Butterfly Garden: Turning Your Garden, Window Box, or Backyard into a Beautiful Home for Butterflies. Matthew Tekulsky (introduction by Robert Pyle). Harvard Common Press, Boston ISBN 0-916782-69-7 192pp 6 x 9 paper, US $8.95 1985

I am a Coleopterist (beetle enthusiast), so I hardly ever get excited about books on Lepidoptera and butterfly gardening. I think I will have to make an exception in this case. Through my connections with Michigan 4-H Youth Programs (Entomology) and the Young Entomologists' Society, I am constantly faced with questions about rearing Lepidoptera and attracting them to the home environment. I now feel I have a complete, all-in-one source of information from which to answer these questions. The introduction by Robert Pyle (Xerces Society), the text by Matthew Tekulsky (free-lance writer and long-time Lepidopterist), and the illustrations by Susanah Brown all blend together to create a resource masterpiece.

Let me see if I can give you some idea of the completeness of this book. Some of the subjects covered are: what is butterfly gardening?, basic butterfly classification, taking the first step, some famous butterfly gardeners, the butterfly life cycle, butterfly behavior, basic butterfly dispersal and distribution (geographical and seasonal), designing your garden, essential ingredients to a successful garden, discouraging birds and other predators, use of exotics, nectar sources, larval food plants, activities in your butterfly garden, hibernation boxes, butterfly houses, how to rear butterflies, and conservation of butterfly populations.

The book also contains several useful appendices, providing the reader with detailed information on 50 common garden butterfly species, nectar sources, where to get plants, where to get butterflies, where to get entomological equipment, butterfly organizations, wildflower and gardening organizations, and further reading. I am impressed by the thoroughness of this resource information. The Young Entomologists' Society is listed as one of the organizations interested in promoting butterfly gardening and the study of Lepidoptera. In most books I have seen, the resource list tends to be incomplete or out-of-date, as demonstrated by the fact that our organization is frequently listed as the "Teen International Entomology Group" - a name that hasn't been used in almost five years!

In addition to the comprehensive nature of this book, I am also pleased with the easy-to-read style. This book should be readily accepted by Lepidopterist, backyard gardener and nature enthusiast. This book should definitely be on the bookshelf of every Y.E.S. member interested in butterflies.

Gary A. Dunn, M.S., R.P.E.
Extension Specialist, USDA
Y.E.S. Advisor/Editor

Department of Entomology
Michigan State University
East Lansing, MI 48824-1115 USA

The Funnelweb. Gillian Scott. Darling Downs Institute Press, Toowoomba, Australia. ISBN 0-909306-23-0 7 x 9 softcover, 67pp 1986 US $14.10 (postpaid).

This book has been written with a special purpose in mind: to set the record straight on one of Australia's most misunderstood venomous Arthropod groups - the funnelweb spiders (Atrax spp.). These spiders have been responsible for 19 deaths and many injuries in the last 3 and 1/2 decades. The book does an excellent job of clarifying the facts and presenting them in a fashion that is easily understood by the non-acharologist.

The funnelwebs occur in eastern Australia, from central Queensland south to Tasmania and west to the Eyre Peninsula of South Australia. They are also known from the Solomon Islands and Papau-New Guinea, and probably remain to be discovered in other areas of the South Pacific.

The text in this book is detailed and thorough, but as mentioned previously, is written in a style that is easily understood by non-scientists. The use of technical and scientific terms is kept to a minimum, and commonly understood terminology is used instead of acharological jargon (except in a few cases were no acceptable common terms are available). The book is bursting with 22 full color photos, 28 black and white photos, and 11 black and white illustrations. The photos are from the collection of Pat Walker.

The book presents the following information: general introduction to spiders (anatomy, biology, and classification), funnelweb spiders (biology, distribution, and ecology), the funnelweb's bite (venom toxicology), avoiding funnelweb bites, spiders similar to funnelwebs, classification of funnelwebs, and references and bibliography.

This book was my first exposure to these little-known spiders of Australia and I found the book informative, factual and comprehensive. Anyone interested in Australian acharology, or spiders in general, will find room for this book on their bookshelf.

The exclusive distributor for this book in the United States is International Specialized Book Services, Inc., 5602 N.E. Hassalo Street, Portland, OR 97213-3640 USA.

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SOCIETY NEWS & BUSINESS

It hardly seems like three months has passed since I assembled the last edition of our Society journal. I am putting the finishing touches on this issue while I am residing at the Huron Mountain Wildlife Foundation Research Center on beautiful Ives Lake in the Upper Peninsula of Michigan, only a mile or so from the southern shore of Lake Superior.

The first thing I want to do is announce the winners of our Writing Competition. THIRD PLACE is awarded to **Michelle Yokoyama** of Corvallis, OR; SECOND PLACE goes to **Mark Yokoyama** of Corvallis, OR; and, our FIRST PLACE winner is **Benjamin Capizzo** of Troup, TX. CONGRATULATIONS to all of these young people. Benjamin will receive "How to Keep Bees and Sell Honey" by W.T. Kelley Co., "Insect Life" by R.H. Arnett, Jr. & R.L. Jacques, Jr., and "The Illustrated Encyclopedia of the Butterfly World" by Paul Smart. Mark will also receive "How to Keep Bees and Sell Honey" and "Insect Life", and "Beetles" by B. Klausnitzer. Michelle will receive "Insect Life" and "California Insects" by by J.A. Powell and C. L. Hogue. The following members will also be receiving a token prize (exotic insect specimens) for their endeavors in this Writing Competition: **Michael Hansen, Richard Hansen, and Eric Olson**.

I would like to take this opportunity to thank our panel of judges: Ross H. Arnett, Jr., Ronald J. Priest, Bryant Mather, Carolyn Klass, Eugene J. Gerberg, Lane Smith and Jay B. Karren.

I would also like to thank the following for furnishing the prizes which we presented to our competition winners: Ross H. Arnett, Jr. and **Prentiss-Hall Books**, Terry Taylor of **Combined Scientific Supply**, Chuck and Connie Ianni of **Ianni Butterfly Enterprises**, Eugene King, and Walter T. Kelley of **Walter T. Kelley Co.**

As previously announced the essays submitted to the Writing Competition will be published in the Fall issue of Y.E.S. QUARTERLY, for all members to enjoy. Keep your eyes open for an announcement of our next competition for members!

AMERICAN ENTOMOLOGICAL SOCIETY ASSISTS Y.E.S.

The next big announcement I have to make is that the American Entomological Society (A.E.S.) has agreed to assist Y.E.S. with a financial contribution in the amount of $150.00. This money has been set aside to help cover the costs of our unique "scholarship" program, which admits disadvantaged entomologists into Y.E.S. free of charge. (If you would like more information on this opportunity, please write to Y.E.S. International Headquarters, Department of Entomology, Michigan State University, East Lansing, MI 48824-1115 USA.) We are fortunate that organizations such as A.E.S. are willing to help us serve the special needs of youth and amateur entomologists. Thank you, A.E.S.!

CALENDAR OF EVENTS

Y.E.S. members will probably be interested in the following entomological events:

1987 4-H Essay Contest, sponsored by the American Beekeeping Federation, Inc. Cash awards for top three national winners (US $250.00, $100.00 and $50.00). Topic: "Products of the Hive and Their Uses". A complete copy of the rules can be obtained from Y.E.S. International Headquarters, Department of Entomology, Michigan State University, East Lansing, MI 48824-1115 USA.

Second International Conference on the Monarch Butterfly. 3-5 September 1986 at Los Angeles, California, USA. Worldwide biology and conservation of Danaus plexippus, a migratory species designated a "Threatened Phenomenon". Open to the public. For further information contact Julian P. Donahue, Natural History Museum of Los Angeles Co., 900 Exposition Blvd., Los Angeles, CA 90007 USA; telephone (213) 744-3364.

Public Exhibiy: "A Multiplicity of Monarchs." 6 September to 30 November, 1986, at the Natural History Museum of Los Angeles County, California, USA. Coinciding with the annual migration of Monarch butterflies from their breeding grounds in western North America to overwintering clusters on the California coast, this magnificent exhibit features exquisite photographs by renowned naturalist/photographer George Lepp. Field trips to witness this natural event, designated a "Threatned Phenomenon", are among the activities scheduled during the exhibit. For further information, contact the Natural History Museum of Los Angeles County, 900 Exposition Blvd., Los Angeles, CA 90007 USA.

International Society of Hymenopterists Looking for Members. If you have an interest in this insect group you might want to consider joining the International Society of Hymenopterists. Dues are only US $5.00 (free to those in eastern Europe), and that includes a copy of the Directory of Hymenopterists! Further information can be had by writing to either Dr. J.B. Wooley, Department of Entomology, Texas A & M University, College Station, TX 77843 USA or Dr. J.C. van Achterberg, Rijksmuseum van Natuurlijke Historie, Raamsteeg 2, Leiden, NETHERLANDS.

SPECIAL ANNOUNCEMENT:

Reserve your copy of the "**Y.E.S. International Entomology Resource Guide**" now!

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MAIL BAG

LETTERS FROM MEMBERS

It's always nice to hear from our members. I enjoy reading about all of the activities our members are involved in.

Toshiyuka Ichikawa has sent copies of the new publications he co-authored with Shuji Okajima (A New Stag Beetle of the Genus *Aegus* (Coleoptera, Lucanidae) from Taiwan) and with Hiroshi Fujita (A New Species of the Genus *Prismognathus* (Coleoptera, Lucanidae) from Northern Thailand.

Pandurang Mohite has written to say he has been selected by the Government of India to receive advanced training in plant protection at the International Agricultural Center in the Netherlands. Congratulations, Pandurang!

Bryant Mather responded to my challenge for greater participation by members. He had a number of comments he wanted to share with other Y.E.S. members, and some requests for help from other members:

1. Where to collect? - People keep asking me where to collect. My answer, based on my experience, is *anywhere*! I have collected thousand of specimens on store fronts, in airports, in gas stations, on walls outside hotels and motels, on motel advertising signs, etc., etc. Both of the butterflies named *matheri* were collected on the grounds of hotels (in Mexico) where I was attending a business meeting of chemists and engineers.

2. What to do with what you collect? I don't believe in papered specimens. Every specimen I ever collected got relaxed (if it needed to be), pinned, spread, and labelled as the number 1 priority in my insect study activities. I don't regard a specimen as "collected" until it is pinned and labelled. Too many papered specimens lack adequate data or are eaten by *Dermestes* unbeknownst to their owner.

3. "But you can't ship pinned specimens!" Baloney. I have shipped over 250,000 pinned specimens with 98% lack of damage. Modern expanded plastic packing material makes it even easier - and cheaper because of less mass - than it was in the days of excelsior.

4. How can you be sure of what it is? You can't. No one is "sure" about the determination of specimens, but you can be - and you should be - as sure as the experts are. You do this by using determinations by experts. Either you can compare your specimen with one (or better, a series) determined by an expert or you can get yours (or better, a series of yours) looked at by an expert. I have had over 200,000 specimens determined by experts. I have had a few given up to six different names by fewer than six different experts!

5. What do you keep? You keep what you want and have room for, but when you decide to keep specimens you should regard it as a contract between you and a sample of nature that you will preserve and conserve - and when you are no longer willing and able to do so, you see that the material goes to a museum or someone who will continue the contract.

6. What do you lend? You should lend anything you have to a serious, qualified student who needs it to understand better the subject of his or her research. A collection that is not available for use in research should be transferred to a custodian that will make it available.

7. What I lack. I have in my collection a lot of specimens that

incurvarioids, tineids, gracillarids, oecophoids, stenomids, blastobasids, Cossidae, tortricids, Schoenobinae, Crambinae, Phycitinae, and Acrolophidae.

I especially regret (and resent) reading revisions of groups - of which I have material - especially where the reviser is not aware of the occurence of taxa in places I have taken them. There needs to be a better means of spreading the word that "Joe Blow" is working on the genus "Michigania" and if anybody has any NOT from Michigan to please let Joe know! (Editor: We would be happy to run "advertisements" of such requests in Y.E.S. QUARTERLY at any time.)

I am trying to catalog the facts about Lepidoptera (and some other groups) in Mississippi (USA). I have run requests. Few reply.

(Editor: Surely many of our Y.E.S. members share the same feelings and frustrations as Bryant. I know I do! The Young Entomologists' Society is an organization through which we can better communicate and cooperate with one another. If you have needs for help with determinations, collecting tips and ideas, sources for literature, or whatever, let us know at Y.E.S. International Headquarters. We'll do the best we can to mobilize the collective abilities of Y.E.S. and its members to assist you! Furthermore, if you would like to offer your help to other members (e.g, making determinations, loaning material, hosting collectors in your area, or whatever), please let us know at Y.E.S. International Headquarters. This way we stand a better chance of matching those asking for help with those offering help! Y.E.S. has many ways of serving its members.)

Daniel Cimbaro has written to say he has had to move from Venezuela to the United States. His new address is 4678 Kelmer Drive, West Palm Beach, FL 33415 USA.

PUZZLES &GAMES

WORD SEARCH

Can you find the 26 orders of insects hidden in this word search puzzle? Some of the words are vertical, some are horizontal, some are backwards, and some go from bottom to top. The hidden orders are:COLLEMBOLA, THYSANURA, EPHEMEROPTERA, PLECOPTERA, ISOPTERA, EMBIIDINA, PSOCOPTERA, ANOPLURA, HEMIPTERA, NEUROPTERA, MECOPTERA, LEPIDOPTERA, DIPTERA, PROTURA, DIPLURA, ODONATA, ORTHOPTERA, DERMAPTERA, ZORAPTERA, MALLOPHAGA, THYSANOPTERA, HOMOPTERA, COLEOPTERA, TRICHOPTERA, HYMENOPTERA, and SIPHONOPTERA.

P L E C O P T E R A C A L O B M E L L O C L Y

S U H R M E C O P T E R A R U L P O N A A B K

O N A W E M T L Y H D Z U H V I K T T Y R H E

C A R Q U B X C G P O F Y P M D A H R C E R A

O R E I S O T T E R A M U T A Z O Y I O T W P

P E T O B X P A W I E N O V I L E S C L P E Z

T T P H Y L A U Q N L U B P T L R A H E O N G

E P I J U R P R O T U R A S T I B N O O R Z A

R A D L A W O P R I C P E W N E S S U P E Q U

A M C O R A T K M A W O U P A B R R T T M Y E

X R E D L E P I D O P T E R A V Q A E E E N Y

Y E A T R M A L L O P H A G A B H I R R H Y O

A D Z A R E T P I M E H U W T N I S A A P E A

J U W C Z O R A P T E R A R E T P O R U E N L

U N T H Y S A N O P T E R A B D I P L U R A Y

S I P H O N A P T E R A F A R E T P O H T R O

Z O A R P E M B I I D I N A V W O D O N A T A

Puzzle by: Brian Wilson

WORD SEARCH

Can you find the hidden words? They may be horizontal or vertical, frontwards or backwards. Look for the following words: Complete metamorphosis, incomplete metamorphosis, head, egg, producer, consumer, photosynthesis, energy, Thysanura, Orthoptera, adult, dcomposer, abdomen, larva, pupa, nymph, cast, chitin, exoskeleton, thorax, wings, mouthparts, Diptera, Coleoptera, Hymenoptera, Odonata, Lepidoptera, Neuroptera, Homoptera, Hemiptera, and spiracles.

C O M L H E M I P T E R A S W K M T I P P

O O H F E G O N C D H O K S A D U L T K H

N L M S A G R C W A S T I T I K L G P U O

S E L P D K S O H D E R A C H I T I N F T

U P A D L H I M I N L N R E C U D O R P O

M I R H P E J P S T O R W C F D H O D H S

E D V K N I T L R D G P Y B L E O N I Y Y

R D A C K E T E O L T G S Q U C M H R M N

P P N G R S H T M K R F T Y S O O M E E T

B T Y A S P Y E C E C A S T I M P I L N H

T E M J U I S M N O T G L A R P T C F O E

T R P G I R A E C Z L A U K R O E B J P S

D A H T Y A N T J I E E M F O S R I H T I

D E F S I C U A O T N X O O H E A J I E S

F O L T D L R M P K E T S P R R I N A R N

P U B R K E A O J U L H C O T P H K N A F

P U P A Z S I R H I R Y O P M E H D E W K

F I N P X H M P B I O H J D S Y R O P N I

L P O H A F D H U M P W I N G S F A S R T

W Y R T R S D O P L T D I F N B C P J I X

H E L U O K M S T O E T U Y M N Y B C E S

G K F O H T R I F S R F O P R T H I N A D

A S E M T F R S F K A D R E N E M O D B A

O R T H O P T E R A F D R N L O P H I N K

R Y O N L E X O S K E L E T O N I M P O D

Find these words: aphid, mayfly, honey bee, ant lion, ox beetle, morning cloak, polyphemus moth, American burying beetles. Words may be down or across, forwards or backwards.

W F G Y B X Z O X F J L M K O D A E J J F C V B N N S A W R

D D G H S R G J K Y E G J E G I H C S N D M F D R X D A N E

D D S F W G P W J W J E A T D H N F F F E S G S H A H A H I

S A S E U W O D S S Q U D S E P D F F S J D G D E S S N Y Y

V G T R F H L J N N O I L T N A G F D C X Z A Q D B H T H U

H K K N F X Y G J N B V C X Z K L P I Y R T E W Q S O L O P

J H F G D D P F N C X Z T E L P I O D R B N F D C N N L U G

B H T R F S H F G H J K L Z X C V B N M Q W R T Y P E D F Y

G K J Y V F E K J G G C A O E S U Z K A I F E A Y N Y G H H

V H S O U Y M O R N I N G C L O A K M N V G T U I R B Y E G

G J G J F E U I N I F T K G O D I A D I F G H J K Y E S S E

N J D E T H S H D A R A H W T A T Q U A R T O X B E E T L E

J K U J H H M N J S F H V B D I P L M B X W Z H H J K N G D

J H F R E A O D S E C L O A K K F S A K S R U E A Q U R G I

A S G R E W T H N H G E J M G J T F V M N I P Q X G S A N G

D D H C M Y H E W Q B U K F S B X M N H G F V X U I T E H O

F A M E R I C A N B U R Y I N G B E E T L E L S H X B T R G

S H K U G J F N W T P L B F E L K M D V T E N Q Z F N R I C

D F G H H K E B X Y L D T W A B X K Y M A Y F L Y N U W S P

Puzzle by: Richard Dee Hansen
2755 Heritage Ave.
Boise, ID 83709 USA

FIELD NOTES

Locality: USA, Michigan, Monroe Co., Erie; US Hwy 25 between N. Bevore & Larchmont roads.
Date: 30 November 1985
Collector: Gary J. Lovell and Kenneth Swartz.
Conditions: Cloudy, calm, 41 F; low shrubs and tall grass along roadside and ditch.
Specimens: egg mass of Mantid religiosa (European mantis) - 15 (left 7); two specimens had two egg masses on one stick. Hylophora cecropia - 5 cocoons and Antheraea polyphemus - 6 cocoons (left 2).

(NOTE: I collect cocoons of Saturniidae and egg cases of Mantidae for further study after they hatch in the spring. Because populations fluctuate and the cocoons can be hard to find, my friends and I have voluntarily agreed to leave some as a conservation measure. Usually we leave every other cocoon, except in the case of unusual specimens (such as extra large or small, or two on a single branch, etc.). Gary J. Lovell, 3818 Watson, Toledo, OH 43612 USA)

Locality: USA, Wisconsin, Vilas Co., near Presque Isle (northeastern part of Wisconsin)
Date: from June 30 to July 2, 1986
Collector: Eric Olson (5117 Flad Ave., Madison, WI 53711 USA)
Conditions: About 60 F, on dark nights; used 1 blacklight setup and "wake up and capture".
Specimens: Pachysphinx modesta (3), Paonias excaecatus (7), and Dryocampa rubicunda (1).

FIELD NOTES FOR TROX SUBEROSUS (COLEOPTERA: SCARABAEIDAE: TROGINAE) IN THE STATE OF TACHIRA, VENEZUELA

Daniela Havranek
U.N.E.T., Apartado 436
San Cristobal, Tachira
VENEZUELA

Pitfall traps baited with fish were placed in La Tuquerena Farm, Rubio, State of Tachira. Besides other insects, individual specimens of Trox suberosus (Fabr.) were caught during the month of April, May and June 1982. Rubio is at an altitude of 800 meters.

Local students have also brought in specimens from: Colon, 21-iv-1983, 800m; San Cristobal, 26-v-1984, 1000m; Rubio, 15-iv-1983 and 29-vi-1984, 800m; and Zorca, 19-x-1983 and 1-iii-1984, 900m. (Note: one of the specimens from 1982 was identified by Dr. Brent Radcliffe, W436 Nebraska Hall, University of Nebraska, Lincoln, NE 68588 USA.)

FIELD NOTES FOR AGROMYZIDAE (DIPTERA): PESTS OF CROPS IN THE STATES OF TACHIRA AND MERIDA, VENEZUELA.

Daniela Havranek
U.N.E.T., Apartado 436
San Cristobal, Tachira
VENEZUELA

1. Melanagromyza tomaterae Steyskal, 1972

This fly is a pest of tomato plants (Lycopersicum esculentum Mill.). Its larvae and pupae are found at first boring in the petiuoles, and when the plants are older, in the stems and branches. Summary of field collecting:

LOCALITY (town/village, STATE)	**ALTITUDE**	**DATE**
Arjona nr San Cristobal, TACHIRA	900m	13-ix-1984
El Cobre, TACHIRA*	1100m (approx)	14-vii-1984 1-xii-1984 9-ii-1985 1-1986
La Grita, TACHIRA	1800m	9-ii-1985
Palmira nr San Cristobal, TACHIRA	1300m	10-x-1984
Rubio, TACHIRA	800m	17-xii-1984
San Cristobal, TACHIRA	900m	9-x-1981
San Juan de Lagunillas, nr Merida, MERIDA	1000m	10-ii-1985
San Pablo, nr Bailadores, MERIDA	1400m	9-ii-1985

Note:* - material determined by Dr. K.A. Spencer, Exwell Farm, Bray Shop, Callington, Cornwall, UK.

2. Liriomyza huidobrensis (Blanchard), 1926

This fly is also a pest of vegetables. This time collecting was done only at La Tuquerena Farm, Rubio, TACHIRA. The larvae and pupae were found in leaves of Allium cepa L. and Apium graveolens L., during the month of June 1984, and reared to adults in the laboratory.

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For Sale: Entomological collecting equipment - nets, spreading boards,pins, glassine envelopes, inmsect boxes, books, etc. Send US $1. forcatalog. American Biological Supply Co., 1330 Dillon Heights Ave.,Baltimore, MD 21228 USA. (3/3)

Now Available: Memoirs of the American Entomological Society, No. 35 -A Reconsideration of the Milliped Genus Sigmoria, with a Revision of Deltotaria and an Analysis of the Genera in the Tribe Apheloriini(Polydesmida: Xystodesmidae), by R.M. Shelley and D.R. Whitehead. US $16.00, from the American Entomological Society, 1900 Race Street, Philadelphia, PA 19103 USA. (3/3)

Correspondence Wanted: I am interested in making contact with members with an interest in tarantulas, with a view to exchanging and buying live specimens and exchanging information. Ronald N. Baxter, 45 Chudleigh Crescent, Ilford, Essex, IG3 9AT, ENGLAND. (3/3)

Wanted: Looking for a used (or mint) copy of Hatch (1953), The Beetles of the Pacific Northwest; Darlington (1952), The Carabid Beetles of New Guinea, Part 1 AND Part 2 (Agoniini). Send condition and price to Yves Bousquet, BioSystematics Research Institute, Agriculture Canada, Ottawa, Ontario, K1A 0C6 CANADA. (3/3)

For Sale: Entomological and Lepidoptera books, periodicals, and magazines (back issues). All prices slightly above postage cost. For list send S.A.S.E. to B. O'Shea, c/o 344 Paul Ave., Salinas, CA 93906 USA. (3/3)

Wanted: Pupae and/or cocoons for a live mini-insect zoo exhibit at the Hicksville-Gregory Museum (NY). Donations gladly accepted, will purchase if necessary. J. Scancarelli, Director, Hicksville-Gregory Museum, Heitz Place, Hicksville, NY 11801 USA. (3/3)

Wanted: North American and worldwide robber flies (Diptera: Asilidae). Can send many Italian species of beetles and other orders of insects in exchange. All correspondence welcomed! Cesare Iacovone, Via G. Noventa No. 12, Scala I - int. 3, 00143 Roma, ITALY. (3/3)

Wanted: Less common North American Saturniidae (specimens or live ovae) with data. Any Sphingidae, also. Send offers to Eric Olson, 5117 Flad Ave., Madison, WI 53711 USA. All letters answered. (3/3)

Bird Watchers - Butterfly Collectors: Visit Costa Rica! Over 800 species of birds and 1500 species of butterflies abound throughout the country. Low, fully-inclusive prices, 2-6 persons per group. Write for details, stating interests. TRANSWORLD (yes) Apartado 7911, San Jose, COSTA RICA, C. America. (3/3)

For Sale: Fossiliferous Mazon Creek iron nodules of Pennsylvanian period. Plants and some invertebrates need a good home. All much below retail, buyer resposible for postage. Send self-addressed, stamped envelope for price list. Donald Baumgartner, 150 S. Walnut St., Palatine, IL 60067 USA. (3/3)

Collecting Safari: The tropical rain forests of the world are being destroyed at a rate of twenty million hectares per year (an area about the size of Alaska). Experience the splendor and beauty of these jungles while they are still with us. We offer some of the finest organized safaris available. Your vacation and collecting trip in one package! For brochures and information contact Darien Compound Safaris, Special Tours and Travel, P.O. Box 909, Panama 9A, PANAMA Tel. 55-7272 (3/3)

Will Trade: A Field Guide to the MOTHS of Eastern North America by Charles V. Covell, Jr. (hardbound and like new - used three times). Will trade for publications on CVoleoptera or a reasonable number of cerambycid (long-horned) beetles. All letters answered. Bobby Montgomery, RR - 1, Savannah, MO 64485 USA. (3/3)

For Sale or Trade: Megarhyssa aterata (Hymenoptera) and its host Tremex columba (Hymenoptera) (adults and immatures of both). In all there are 41 8-dram vials with approx. 55 specimens preserved in 190 proof alcohol. The specimens were collected in Missouri, and I will include 4+ pages of field notes in additiona to the usual collection data. Will sell for US $50.00 or trade for publications on Coleoptera or for specimens of Cerambycidae. All letters answered. Bobby Montgomery, RR - 1, Savannah, MO 64485 USA. (3/3)

New Fall Catalog!: Illustrated, expanded catalog. Species from South and Central America, Africa, Indonesia, Europe, etc. Specialists in Morpho and Parnassius subspecies (request special listing). Prompt delivery, top quality. Send US $1 for catalog or $6 for monthly lists/catalogs for 1 year. Transworld Butterfly Co. (YES), Apartado 7911, San Jose, COSTA RICA, C. America. (3/3)

For Sale or Exchange: Giant flower-loving flies (genus Rhaphiomidas), various species, size 20 - 30+ mm. Also, Mydas fly (Neomydas pantherinus). Many other large, rare Diptera from western USA, some with empty (but perfect) pupal case. S.A.S.E. for prices. Will exchange for other large Diptera (20 mm & up) worldwide. Contact: Rick Rogers, 2630 Palm Drive, Hermosa Beach, CA 90254 USA. (3/2)

For Sale: Worldwide distributor of superior quality entomological supplies books and living material. Send US $1.00 for catalog. We specialize in prompt, courteous service. American Biological Supply Co., 1330 Dillon Heights Ave., Baltimore, MD 21228 USA. Phone (301) 747-4500 (3/2)

Wanted: Coccinellidae, worldwide. Will purchase or exchange. Send offer to: Francesco Isgro, 2002 Wellfleet Court, Falls Church, VA 22043 USA (3/2)

For Sale or Exchange: Black-winged damselflies, Calyopteryx maculata (males and females) with complete data. Interested in offers from anywhere in world. Contact: David C. Patten, General Delivery, Peace Valley, MO 65788 USA All letters answered. (3/2)

Wanted: Male and female specimen of the black witch (giant noctuid). This species is primarily tropical but does wander north to Canada; it is a pest in Hawaii. Write to: David C. Patten, General Delivery, Peace Valley, MO 65788 USA (3/2)

For Sale: Many kinds of insects, for scientific studies or just for collections; named or unnamed, lots or single specimens, pinned and labelled or papered. Collections are named, pinned and labelled. WANTED: Tenebrionidae from arid areas of South America (only) such as: Patagonia, high Andes ranges, etc. EXPEDITIONS: to any area of South America to collect, study or photograph insects. Vacancies for two people and gear in a camper. 40 years experience. Send inquiries to: Luis E. Pena G. P.O. Box 2974, Santiago, CHILE. (3/2)

For Sale: Formosan butterflies, moths, beetles and other dried insects. Also, live coccoons and ovae of moths. Write to: P.T. Chang, P.O. Box 873, Taipei, Taiwan, REPUBLIC OF CHINA. (3/2)

For Sale: Worldwide Lepidoptera, also some Coleoptera. Top quality papered specimens, with complete data. Good prices. Satisfaction guaranteed. Also for sale: Elephant-brand insect pins, and the books "The Illustrated Encyclopedia of the Butterfly World" by Smart and "Butterflies of the World" by Lewis. Send US $1 and legal size SASE for pricelist. Your $1 refunded with first order. Thomas Greager, R.D. #6, Box 56-B, Greensburg, PA 15601 USA. (3/2)

Wanted: Copies of the books: "Mosquitoes - Their Bionomics and Relation to Disease" by W. Horsfall (1955); "Myiasis in Man and Animals of the Old World" by F. Zumpt (1965); and "The Mosquitoes of Canada" by D.M. Wood et al. (1979). Will pay a reasonable price and shipping costs. Donald Baumgartner, 150 S. Walnut St., Palatine, IL 60067 USA (3/2)

Wanted: Markets for informative articles on insects and spiders, illustrations, and editorilas on wildlife and environmental issues. Cartoons, too. Eric R. Eaton, 2310 S.W. Bertha Blvd. Apt. 5, Portland, OR 97201 USA. (3/2)

For Sale: A1 papered Central and South American Prepona. A wide selection. Also sell African Charaxes and various Nevadan butterflies and large and medium Dynastinae. For a free list, write to: Mark Khun, 1245 Conway Lane, Reno, NV 89503 USA (3/2)

Publications for Exchange: I have a large number of duplicate reprints and photocopies of articles on Coleoptera (mostly Carabidae and Cicindelidae) which I would rather not throw away - they need a good home! I would be willing to accept any reasonable offer of specimens (Carabidae or Cicindelidae) or other literature. A free list is available upon request. Gary A. Dunn, Department of Entomology, Michigan State University, East Lansing, MI 48824-1115 USA. (3/2)

For Sale or Exchange: All orders of insects from Israel, especially Diptera and Hemiptera. Write for details. Izhak Nussbaum, Nahalat zvi 35, Petack-Tikva 49421, ISRAEL. (2/4)

For Sale: Many butterflies, beetles and other insects from all parts of the world. Write for main list and supplementary list every month. FOR EXCHANGE--same for many rarest insects and others. Send your offer. WANTED--all information regarding breeding of Goliathinae, Dynastinae and other Scarabaeidae. Also, we research living material like Dynastes hercules, neptunus, megasoma, Goliathus, etc. Gerald Pelissie, "Les Granges Noires", 01660 Chaveyrait, FRANCE. (2/4)

Wanted: Exchange of Coleoptera, especially Cerambycidae (worldwide). Many types of beetles available from different regions. Gontran Drouin, 50 Principale, Ste.-Henedine, Quebec, CANADA G05 2RO. (2/4)

Wanted: Ovae and pupae of the Lepidoptera, especially Saturniidae, Papilionidae, and Nymphalidae. Willing to buy. Send lists and prices to: David Albaugh, 9 Columbia Avenue, Jamestown, RI 01835 U.S.A. (2/4)

For Sale: Worldwide collectible butterflies, beetles and rare insects, names with data. For subscription to butterfly and beetle price lists send $5.00 to Ianni Butterfly Enterprises. P.O. Box 81171, Cleveland, OH 44181 U.S.A. (2/4)

For Sale: Neotropical insects from northen Central America, or will **Exchange** same for Catocala (Lepidoptera: Noctuidae) especially from Europe, N. Africa, USSR, Central Asia, China or Korea. Also, SELL glassine envelopes in three convenient sizes; take fountain pen and stamp pad ink well. Eduardo C. Welling M., Apartado Postal 701, Merida, Yucatan, MEXICA (2/4)

Exchange or Purchase: Cicidelidae and Carabidae worldwide. All letters answered. Gary A. Dunn, Department of Entomology, Michigan State University, East Lansing, MI 48824-1115 U.S.A. (2/4)

For Sale: Handbook of Insect Rearing, Volumes I and II edited by Pritnam Singh and R. F. Moore. This publication provides a practical guide for those who wish to rear insects for the first time. It is a do-it-yourself book, written in a simple logical style. 474 pp. US $77.75. Available from Elsevier Science Publishers, P.O. Box 1663, Grand Central Station, New York, NY 10163 U.S.A. (2/4)

For Sale: Elefant brand insect pins. Send SASE for prices. Thomas Greager, R. D. #6, Box 56-B, Greensburg, PA 15601 U.S.A. (2/4)

Wanted: Individual(s) interested in exchanging bulk beetle samples from blacklight traps. This could be easily run in the same fashion as the Y.E.S. Swap Box program. Write to Gary A. Dunn, Department of Entomology, Michigan State University, East Lansing, MI 48824-1115 U.S.A. (2/4)

Wanted: Livestock of the Buckeye, Junonia (Precis) coenia. Willing to trade or buy. Contact Kathy Miktuk, RD #1, Box 119, Panama, NY 14767 U.S.A. (2/4)

Exchange: Lepidoptera (worldwide), especially Nymphalidae and Pieride; also other families--Hesperiidae, Papilionidae, etc., and Coleoptera (worldwide), especially Cerambycidae and Scarabaeidae. All letters welcome and answered. Luis R. Perez, HC 02 Box 18881, San Sebastian, Puerto Rico 00755 U.S.A. (2/4)

Wanted: Cerambycidae from all over the world in exchange for specimens from Europe and the Soviet Union. Elvira Barchet, 6470 Clybourn Ave., #242, North Hollywood CA 91606. U.S.A. Telephone (213) 761-3764. (2/4)

For Sale or Exchange: Cocoons of A. luna, A. io lutheri, and C. promethea. SASE for prices. Will also accept desirable papered butterflies with data in exchange for cocoons. Larry J. Kopp, R. Box 30, Klingerstown, PA 17941. (2/4)

For Exchange: Will exchange many species of butterflies from Mayalasia, Phillipines, Taiwan, some from Africa, Peru, Brasil, and Europe, all in A1 quality, for A1 specimens from other countries (USA, Canada, Central America, South America, Australia, Indonesia, India, etc.). Exchange preferred, but can also buy. Please write to Patrick M. Malesieux, 87, rue Delhaye 59 148 Flines les Raches, FRANCE, (2/4)

To Exchange or Purchase: N.A., Neotropical Lepidoptera ova, pupae and cocoons. Offer in exchange fine exotic material. M. Zappalorti, Sr., 123 Androvette Street, Staten Island, NY 10309 U.S.A. (2/4)

Wanted: Worldwide Cicindelidae in trade for worldwide Lepidoptera. Willing to give several different or same species depending of type of Cicindelidae. All letters welcome. Contact: Ryan Bridge, 4329 Old Orchard Rd., York, PA 17402. U.S.A. (2/4)

Wanted: Information on how to receive Atticus atlas formosanus ovae, larvae, or pupae. Contact: Ryan Bridge, 4329 Old Orchard Rd., York, PA 17402. U.S.A. (2/4)

Wanted: Cicindelidae and Carabidae (Carabus, Cychrus, Scaphinotus, Calosoma, Anthinae only) species and literature. Worldwide beetles available of all families. Cesare Iacovone, Via G. Noventa #12, Scala I--int. 3, 00143, Roma, ITALY. (2/4)

For Sale: Large selection of papered Malaysia Butterflies, beetles, and other insects, all of A1 quality with date. Free catalog available from: Deco Enterprise, P.O. Box 155, TAIPING, Malaysia (2/4)

Help Available: To Y.E.S. members, ages 17 and up, collecting in the vicinity of Oviedo, Florida, northeast of Orlando. Housing, microscope, and library available with local Y.E.S. member. For more information, contact the Y.E.S. Trading Post. (2/4)

Wanted: California Academy of Science Insect drawers, cabinets, or unit trays; determined insect specimens (any group); and journals, books and reprints from College of Idaho Museum of Natural History. Send materials to: William H. Clark, Assistant Director, Museum of Natural History, College of Idaho, Caldwell, ID 83605. ALL CONTRIBUTIONS ARE TAX DEDUCTIBLE! (2/4)

Wanted: Copy of the Butterfly Book by W. J. Holland. Most recent edition preferred, by not necessary. Will buy for a reasonable price. Kent Hudson, Box 85, Hinsboro, IL 61930 U.S.A. (2/4)

For Sale or Exchange: Many insect orders from the Southeast U.S., including cecropias, Dianas, stag beetles and cicada killers. Quantities very limited. Write for complete details. Bryan Belay, Rt. 1, Box 291, Pearisburg, VA 24134

Wanted: Information and advise on giant silk moth (cecropia, promethea, polyphemus and luna) mating behavior and male assemblages. Also, suggestions for a reference for identification of North American mantids and other Orthoptera. Gary J. Lovell, 3818 Watson, Toledo, OH 43612 U.S.A (3/1)

Wanted: Deadstock (specimens) of any insect for life-cycle displays. Any size acceptable, but must be in reasonable condition; this includes cocoons, pupae, larvae, immature insects (prefer Lepidoptera, though). Willing to buy/trade. Ryan Bridge, 4329 Old Orchard Road., York, PA 17402 U.S.A. (3/1)

Exchange Wanted: Will exchange Cicindelidae and other insects from New York state and New England for any part of the U.S. or world. All letters will be answered. Michael A. Valenti, 135 Jamesville Ave., Syracuse, NY 13210 U.S.A. (3/1)

Wanted: Information on rearing Acherontia atropos, Deathshead Hawk moth (Sphingidae). Also interested in obtaining livestock of this species. Write to: Randy Robinette, 7302 Midland Trail Rd., Ashland, KY 41101 U.S.A. or Call: (606) 928-3401.

Free Publication: "A Planting Guide for Virginia Nectar-Seekers" by Patricia M. Purdy (a Y.E.S. member) and Jeffrey M. Curtis (Wildlife Education Coordinator for State of Virginia) and published by the Virginia Non-Game Wildlife Fund. This 18 page pamphlet is packed with information for attracting birds and butterflies. Send requests to: Young Entomologists' Society, Department of Entomology, Michigan State University, East Lansing, MI 48824-1115 U.S.A. (3/1)

Help Needed: A small library at a USDA sponsored research center in Saudi Arabia has notified Y.E.S. that they would be very appreciative of a donation of any entomology books or periodicals. They are in dire need of many out-of-print books (especially Coleoptorum Catalogue, 1910-1940, The Hague) on taxonomy, biology an the like. They would also be interested in corresponding with taxonomic entomologists who might be able to assist with various Saudi research projects. To make donations, or for further information, contact Dorothy Jessop, USDA/OICD, Room 4103 Auditors Bldg., Washington, DC 20250 (202) 475-4190. (Ed. Note: They are now receiving all Y.E.S. publications.) (4/1)

Wanted: Willing to identify, exchange or purchase buprestids on a worldwide basis. Please contact: Dr. Stanley Wellso, Department of Entomology, Michigan State University, East Lansing, MI 48824-1115 U.S.A. (3/1)

For Sale: Philippine insects--dried and papered specimens. Please contact Elizabeth Lumawig, P.O. Box 2684, Manila, PHILLIPPINES. (3/1)

For Sale or Exchange: Butterflies and moths, also some odd insects, I collected in New Zealand last winter. Also, Lepidoptera from North America, Europe and Japan, including several much-sought western species and subspecies. John Reichel, P.O. Box 789, Revelstoke, British Columbia, VOE 2SO, CANADA (3/1)

For Sale: Sphingidae, Nymphalidae, Saturniidae, Helioconidae, ithomid sp., Caligos, and Morphidae. Also, Automeris, sp., Euchroma gigantea, Titanus gignateus, Harlequin, long horn beetles, Megasoma elephas, golden scarab and others. Darien Compound Safaris, P.O. Box 909, Panama 9A, REPUBLIC OF PANAMA. (3/1)

Wanted: Livestock of Saturniidae and Ceratocampidae. Send price list to: Jeff Miller, 550 Conifer Way, Ashland, OR 97520 U.S.A. (3/1)

For Sale: The rarest Rhopalocera from Reunion Island (near Madogascar). Quality A1, papered, named. **For Exchange:** Insects from Reunion, all of A1 quality, named with data. **Wanted:** Morpho, Papilio, Agrias preforia, Saturniidae, Danaidae, Ornithoptera, Troides, Dynastinae, Lucanidae, Goliathidae, Buprestidae, Phasmidae--top quality, papered and with complete data. ALSO, willing to offer information, publications, and identifications on insects of the madagascerene area. T. Claude Anderes, 18 Residence Caravelle, Blve. de la Providence, 97400 St. Denis, Ile de la REUNION (FRANCE). (3/1)

Wanted: Correspondence with retired entomologists with background in tropical Lepidoptera and Hemiptera. Also, I am willing to share some native California Lepidoptera with young entomologists. Write to: Dr. Joe Vredenburgh, 6656 Trigo "B", Goleta, CA 93117 U.S.A. (3/1)

Collection for Sale: Large collection of South African Lepidoptera, also some Coleoptera, Diptera, Hymenoptera, and Homoptera. Butterflies: Danaidae, Acraeidae (41), Salyridae, Nymphalidae (60-includes separate spp.), Charaxes (100), Papilionidae (60 spec.), Pieridae, Libytheidae, Lycanaenidae, and Hespenidae; Moths: (represent almost all species in southern Africa) Swifts, Goats, Clearwings, Loopers, Hooktips, Silks, Emperors (100), Eggars, Monkeys, Hamks (120), Tigers, Tussocks, owls and many others. 220 specimens in other orders. Prefer to sell collection as a whole, but will consider selling all butterflies, all moths and all other orders as separate unites. Best offer. For information or bids, contact Mr. P.G. Woods, 8 Parker Gardens, Merritt Ave., Warner, Beach, 4125 REPUBLIC OF SOUTH AFRICA (3/1)

Wanted: Phasmida (stick and leaf insects). Livestock and deadstock. I specialize in this order, and in particular seek Timema species from California and other areas (eggs). I can purchase or exchange for Phasmida other orders. All letters answered. Paul D. Brock, "Papillon", 40 Thorndike Rd., Slough, SL 2 1 SR. ENGLAND. (3/1)

Wanted: Butterflies and Coleoptera, especially scarabaeidae and Lucanidae, from Central and South America, especially Columbia, Peru, Bolivia, or Venezuela. I would prefer to buy, rather than trade. Send all lists/letters to Tetsuo Nawa, The Nawa Insect Museum, Gifu Park, 2-18 Ohmiya-cho, Gifu City, JAPAN (3/1)

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